Professional Master's Degree
Artificial Intelligence in Dentistry

tech technological university

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Professional Master's Degree
Artificial Intelligence in Dentistry

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/pk/dentistry/professional-master-degree/master-artificial-intelligence-dentistry**

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01

Introduction

The application of Artificial Intelligence (AI) in dentistry has radically transformed the way oral diseases are diagnosed, treated and prevented. This technology has not only streamlined the radiographic and tomographic image analysis processes, enabling more accurate detection of dental problems, but has also driven the development of customized treatment planning assistance systems. The ability of algorithms to process large amounts of clinical data and suggest treatment options based on specific patterns has improved the decision making of dental professionals. In this context, TECH has developed an educational plan that delves into the most recent innovations in this field.

The use of AI in Dentistry will improve the accuracy of diagnoses and treatments. What are you waiting for to enroll?"

Artificial Intelligence (AI) emerges as an invaluable ally in Dentistry, empowering dentists' ability to provide quality, predictive and patient-centered care. Machine learning algorithms can analyze large data sets, such as X-rays, medical records and genetic studies, to identify subtle patterns that might go unnoticed by the human eye. This facilitates early detection of oral diseases, personalized treatment planning and outcome prediction.

For this reason, TECH has created this Professional Master's Degree, which stands out for its comprehensive and progressive approach, designed for students to delve into all the key facets of the integration of AI in the dental field. Graduates will learn everything from the fundamentals of AI and its specific use in diagnostics and treatment, to its advanced applications in 3D printing, robotics, clinical management and data analysis.

In addition, there will be a practical approach, integrating AI effectively into dental practice and preparing professionals to face ethical, regulatory and future challenges. In addition, ethical knowledge will be explored, as well as policies and regulations, ensuring that specialists update their skills to lead in the era of advanced AI in dentistry. Likewise, the optimization of patient experience and clinical efficiency will be discussed, without overlooking the preparation for digital transformation in dental education.

With the objective of training highly skilled AI experts, TECH has devised a comprehensive program based on the unique Relearning methodology. This learning system will help students strengthen their understanding through the reiteration of key concepts. All you need is an electronic device with an Internet connection to access the content at any time. Without the need to attend in person or meet fixed schedules, professionals will be able to balance their daily routine with a high quality program.

This **Professional Master's Degree in Artificial Intelligence in Dentistry** contains the most complete and up-to-date scientific program on the market. The most important features include:

- The development of case studies presented by experts in Artificial Intelligence in Dentistry
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

Get up to speed with an advanced and adaptable academic program! You'll get a solid foundation in the principles of Artificial Intelligence in Dentistry"

Bet on TECH! Through this 100% online Professional Master's Degree, you will address the impact of Big Data in Dentistry, examining key concepts and applications"

You will be able to interpret dental images using AI applications, all thanks to the most innovative multimedia resources.

Benefit from case studies that illustrate the effective use of Artificial Intelligence in various aspects of Dentistry.

The program's teaching staff includes professionals from the field who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the academic year For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

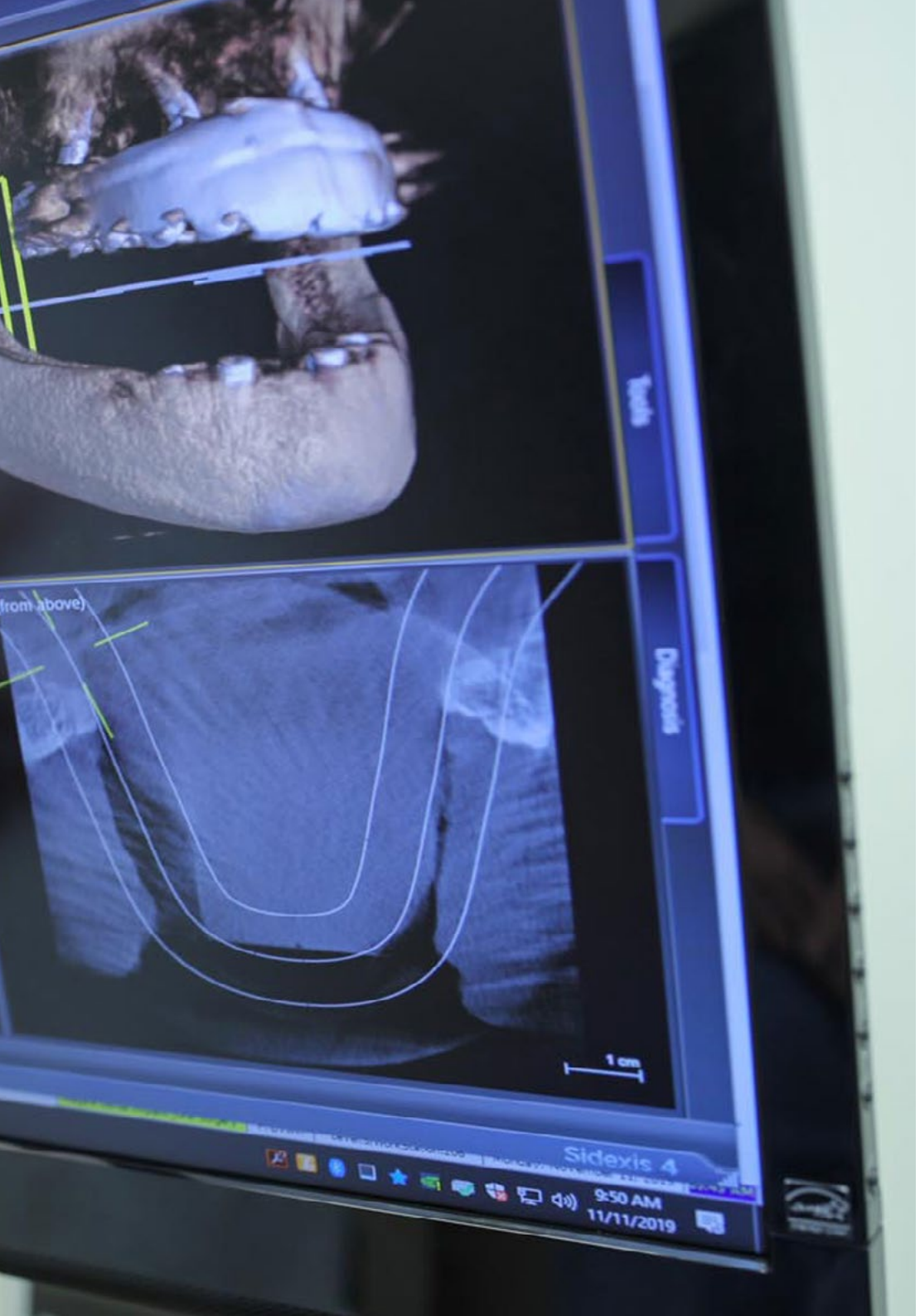
Objectives

The main objective of this program is to provide professionals with the technical skills and specialized knowledge to effectively apply Artificial Intelligence in the diagnosis, treatment and management of oral health. In this way, the program will focus on providing a thorough understanding of the fundamentals of AI, as well as its specific application in the interpretation of radiographic images, analysis of clinical data and development of predictive tools for dental diseases.

Through ethical and legal understanding, you will effectively prioritize the privacy and integrity of patient information"

General Objectives

- Understand the theoretical foundations of Artificial Intelligence
- Study the different types of data and understand the data lifecycle
- Evaluate the crucial role of data in the development and implementation of AI solutions
- Delve into algorithms and complexity to solve specific problems
- Explore the theoretical basis of neural networks for *Deep Learning* development
- Explore bio-inspired computing and its relevance in the development of intelligent systems
- Analyze current strategies of Artificial Intelligence in various fields, identifying opportunities and challenges
- Gain a solid understanding of *Machine Learning* principles and their specific application in dental contexts
- Analyze dental data, including visualization techniques to improve diagnostics
- Acquire advanced skills in the application of AI for the accurate diagnosis of oral diseases and interpretation of dental images
- Understand the ethical and privacy considerations associated with the application of AI in dentistry
- Explore ethical challenges, regulations, professional liability, social impact, access to dental care, sustainability, policy development, innovation, and future prospects in the application of AI in dentistry



Specific Objectives

Module 1. Fundamentals of Artificial Intelligence

- Analyze the historical evolution of Artificial Intelligence, from its beginnings to its current state, identifying key milestones and developments
- Understand the functioning of neural networks and their application in learning models in Artificial Intelligence
- Study the principles and applications of genetic algorithms, analyzing their usefulness in solving complex problems
- Analyze the importance of thesauri, vocabularies and taxonomies in the structuring and processing of data for AI systems
- Explore the concept of the semantic web and its influence on the organization and understanding of information in digital environments

Module 2. Data Types and Data Life Cycle

- Understand the fundamental concepts of statistics and their application in data analysis
- Identify and classify the different types of statistical data, from quantitative to qualitative data
- Analyze the life cycle of data, from generation to disposal, identifying key stages
- Explore the initial stages of the data life cycle, highlighting the importance of data planning and structure
- Study data collection processes, including methodology, tools and collection channels
- Explore the Datawarehouse concept, with emphasis on the elements that comprise it and its design
- Analyze the regulatory aspects related to data management, complying with privacy and security regulations, as well as best practices

Module 3. Data in Artificial Intelligence

- Master the fundamentals of data science, covering tools, types and sources for information analysis
- Explore the process of transforming data into information using data mining and visualization techniques
- Study the structure and characteristics of *datasets*, understanding their importance in the preparation and use of data for Artificial Intelligence models
- Analyze supervised and unsupervised models, including methods and classification
- Use specific tools and best practices in data handling and processing, ensuring efficiency and quality in the implementation of Artificial Intelligence

Module 4. Data Mining. Selection, Preprocessing and Transformation

- Master the techniques of statistical inference to understand and apply statistical methods in data mining
- Perform detailed exploratory analysis of data sets to identify relevant patterns, anomalies, and trends
- Develop skills for data preparation, including data cleaning, integration, and formatting for use in data mining
- Implement effective strategies for handling missing values in datasets, applying imputation or elimination methods according to context
- Identify and mitigate noise present in data, using filtering and smoothing techniques to improve the quality of the data set
- Address data preprocessing in *Big Data* environments

Module 5. Algorithm and Complexity in Artificial Intelligence

- Introduce algorithm design strategies, providing a solid understanding of fundamental approaches to problem solving
- Analyze the efficiency and complexity of algorithms, applying analysis techniques to evaluate performance in terms of time and space
- Study and apply sorting algorithms, understanding their performance and comparing their efficiency in different contexts
- Explore tree-based algorithms, understanding their structure and applications
- Investigate algorithms with *Heaps*, analyzing their implementation and usefulness in efficient data manipulation
- Analyze graph-based algorithms, exploring their application in the representation and solution of problems involving complex relationships
- Study *Greedy*algorithms, understanding their logic and applications in solving optimization problems
- Investigate and apply the backtracking technique for systematic problem solving, analyzing its effectiveness in various scenarios

Module 6. Intelligent Systems

- Explore agent theory, understanding the fundamental concepts of its operation and its application in Artificial Intelligence and software engineering
- Study the representation of knowledge, including the analysis of ontologies and their application in the organization of structured information
- Analyze the concept of the semantic web and its impact on the organization and retrieval of information in digital environments
- Evaluate and compare different knowledge representations, integrating these to improve the efficiency and accuracy of intelligent systems
- Study semantic reasoners, knowledge-based systems and expert systems, understanding their functionality and applications in intelligent decision making

Module 7: Machine Learning and Data Mining

- Introduce the processes of knowledge discovery and the fundamental concepts of machine learning
- Study decision trees as supervised learning models, understanding their structure and applications
- Evaluate classifiers using specific techniques to measure their performance and accuracy in data classification
- Study neural networks, understanding their operation and architecture to solve complex machine learning problems
- Explore Bayesian methods and their application in machine learning, including Bayesian networks and Bayesian classifiers
- Analyze regression and continuous response models for predicting numerical values from data
- Study *clustering* techniques to identify patterns and structures in unlabeled data sets
- Explore text mining and natural language processing (NLP), understanding how machine learning techniques are applied to analyze and understand text

Module 8. Neural networks, the basis of Deep Learning

- Master the fundamentals of Deep Learning, understanding its essential role in Deep Learning
- Explore the fundamental operations in neural networks and understand their application in model building
- Analyze the different layers used in neural networks and learn how to select them appropriately
- Understanding the effective linking of layers and operations to design complex and efficient neural network architectures
- Use trainers and optimizers to tune and improve the performance of neural networks
- Explore the connection between biological and artificial neurons for a deeper understanding of model design
- Tuning hyperparameters for Fine Tuning of neural networks, optimizing their performance on specific tasks

Module 9. Deep Neural Networks Training

- Solve gradient-related problems in deep neural network training
- Explore and apply different optimizers to improve the efficiency and convergence of models
- Program the learning rate to dynamically adjust the convergence speed of the model
- Understand and address overfitting through specific strategies during training
- Apply practical guidelines to ensure efficient and effective training of deep neural networks

- Implement Transfer Learning as an advanced technique to improve model performance on specific tasks
- Explore and apply Data Augmentation techniques to enrich datasets and improve model generalization
- Develop practical applications using Transfer Learning to solve real-world problems
- Understand and apply regularization techniques to improve generalization and avoid overfitting in deep neural networks

Module 10. Model Customization and Training with TensorFlow

- Master the fundamentals of TensorFlow and its integration with NumPy for efficient data management and calculations
- Customize models and training algorithms using the advanced capabilities of TensorFlow
- Explore the tfdata API to efficiently manage and manipulate datasets
- Implement the TFRecord format for storing and accessing large datasets in TensorFlow
- Use Keras preprocessing layers to facilitate the construction of custom models
- Explore the TensorFlow Datasets project to access predefined datasets and improve development efficiency
- Develop a Deep Learning application with TensorFlow, integrating the knowledge acquired in the module
- Apply in a practical way all the concepts learned in building and training custom models with TensorFlow in real-world situations

Module 11. Deep Computer Vision with Convolutional Neural Networks

- Understand the architecture of the visual cortex and its relevance in Deep Computer Vision
- Explore and apply convolutional layers to extract key features from images
- Implement clustering layers and their use in Deep Computer Vision models with Keras
- Analyze various Convolutional Neural Network (CNN) architectures and their applicability in different contexts
- Develop and implement a CNN ResNet using the Keras library to improve model efficiency and performance
- Use pre-trained Keras models to leverage transfer learning for specific tasks
- Apply classification and localization techniques in Deep Computer Vision environments
- Explore object detection and object tracking strategies using Convolutional Neural Networks
- Implement semantic segmentation techniques to understand and classify objects in images in a detailed manner

Module 12. Natural Language Processing (NLP) with Natural Recurrent Networks (NNN) and Attention

- Developing skills in text generation using Recurrent Neural Networks (RNN)
- Apply RNNs in opinion classification for sentiment analysis in texts
- Understand and apply attentional mechanisms in natural language processing models
- Analyze and use Transformers models in specific NLP tasks
- Explore the application of Transformers models in the context of image processing and computer vision
- Become familiar with the Hugging Face's Transformers library for efficient implementation of advanced models

- Compare different Transformers libraries to evaluate their suitability for specific tasks
- Develop a practical application of NLP that integrates RNN and attention mechanisms to solve real-world problems

Module 13. Autoencoders, GANs, and Diffusion Models

- Develop efficient representations of data using *Autoencoders, GANs* and Diffusion Models
- Perform PCA using an incomplete linear autoencoder to optimize data representation
- Implement and understand the operation of stacked autoencoders
- Explore and apply convolutional autoencoders for efficient visual data representations
- Analyze and apply the effectiveness of sparse automatic encoders in data representation
- Generate fashion images from the MNIST dataset using *Autoencoders*
- Understand the concept of Generative Adversarial Networks (*GANs*) and Diffusion Models
- Implement and compare the performance of Diffusion Models and *GANs* in data generation

Module 14. Bio-Inspired Computing

- Introduce the fundamental concepts of bio-inspired computing
- Explore social adaptation algorithms as a key approach in bio-inspired computing
- Analyze space exploration-exploitation strategies in genetic algorithms
- Examine models of evolutionary computation in the context of optimization
- Continue detailed analysis of evolutionary computation models
- Apply evolutionary programming to specific learning problems
- Address the complexity of multi-objective problems in the framework of bio-inspired computing
- Explore the application of neural networks in the field of bio-inspired computing
- Delve into the implementation and usefulness of neural networks in bio-inspired computing

Module 15. Artificial Intelligence: Strategies and applications

- Develop strategies for the implementation of artificial intelligence in financial services
- Analyze the implications of artificial intelligence in the delivery of healthcare services
- Identify and assess the risks associated with the use of AI in the healthcare field
- Assess the potential risks associated with the use of AI in industry
- Apply artificial intelligence techniques in industry to improve productivity
- Design artificial intelligence solutions to optimize processes in public administration
- Evaluate the implementation of AI technologies in the education sector
- Apply artificial intelligence techniques in forestry and agriculture to improve productivity
- Optimize human resources processes through the strategic use of artificial intelligence

Module 16. Fundamentals of AI in Dentistry

- Acquire solid knowledge of the basic principles of *Machine Learning* and its specific application in dental contexts
- Learn methods and tools for analyzing dental data, as well as visualization techniques that enhance interpretation and diagnosis
- Develop a thorough understanding of the ethical and privacy considerations associated with the application of AI in dentistry, promoting responsible practices in the use of

these technologies in clinical settings

- Familiarize students with the various applications of AI in the field of dentistry, such as oral disease diagnosis, treatment planning, and patient care management
- Design personalized dental treatment plans according to the specific needs of each patient, taking into account factors such as genetics, medical history and individual preferences

Module 17. AI-assisted Dental Diagnostics and Treatment Planning

- Acquire expertise in the use of AI for treatment planning, including 3D modeling, orthodontic treatment optimization and treatment plan customization
- Develop advanced skills in the application of AI for the accurate diagnosis of oral diseases, including interpretation of dental images and pathology detection
- Obtain competencies to use AI tools in oral health monitoring and oral disease prevention, effectively integrating these technologies into dental practice
- Collect, manage and use both clinical and radiographic data in AI treatment planning
- Enable students to evaluate and select AI technologies suitable for their dental practice, considering aspects such as accuracy, reliability and scalability

Module 18. Innovations and Practical Applications of AI in Dentistry

- Develop specialized skills in the application of AI in 3D printing, robotics, dental materials development, clinical management, teleodontology, and automation of administrative tasks, addressing diverse areas of dental practice
- Acquire the ability to strategically implement AI in dental education and training, ensuring that practitioners are equipped to adapt to constantly evolving technological innovations in the dental field
- Develop specialized skills in the application of AI in 3D printing, robotics, dental materials development, and automation of administrative tasks
- Employ AI to analyze patient *feeback*, optimizing clinical management in dental clinics to improve patient experience
- Strategically implement AI in dental education, ensuring that professionals are equipped to adapt to the ever-evolving technological innovations in the dental field

Module 19. Advanced Analytics and Data Processing in Dentistry

- Handle large datasets in dentistry, understanding the concepts and applications of Big Data, as well as the implementation of data mining and predictive analytics techniques
- Acquire expertise in the application of AI in various aspects, such as dental epidemiology, clinical data management, social network analysis and clinical research, using machine learning algorithms

- Develop advanced skills in the management of large datasets in dentistry, understanding the concepts and applications of *Big Data*, as well as the implementation of data mining and predictive analytics techniques
- Employ AI tools for monitoring oral health trends and patterns, contributing to more efficient management
- Explore and discuss the various ways in which data analytics is used to improve clinical decision making, patient care management and research in Dentistry

Module 20. Ethics, Regulation and the Future of AI in Dentistry

- Understand and address ethical challenges related to the use of AI in dentistry, promoting responsible professional practices
- Inquire into the regulations and standards relevant to the application of AI in Dentistry, developing skills in policy formulation to ensure safe and ethical practices
- Address the social, educational, business and sustainable impact of AI in dentistry, to adapt to changes in dental practice in the era of advanced AI
- Manage the tools necessary to understand and address the ethical challenges related to the use of AI in Dentistry, promoting responsible professional practices
- Provide students with a thorough understanding of the social, business and sustainable impact of AI in the field of dentistry, preparing them to lead and adapt to changes that arise during their professional practice

Get up to date on the most current applications in Artificial Intelligence and apply them to your daily clinical practice as a dentist"

03

Skills

The program in Artificial Intelligence in Dentistry will provide graduates with exceptionally comprehensive and up-to-date training, preparing them to excel in a constantly evolving field. As such, practical applications will be addressed, from diagnostics to clinical management and ethics, so that students will acquire advanced skills and a thorough understanding of the ethical and regulatory challenges in implementing AI in the dental environment. This program is distinguished by its progressive approach, ensuring that professionals are equipped with theoretical knowledge as well as the skills necessary to effectively apply AI in Dentistry.

Bet on TECH! You will lead innovation and technological transformation in Dentistry, a real competitive advantage."

General Skills

- Master data mining techniques, including complex data selection, preprocessing and transformation
- Design and develop intelligent systems capable of learning and adapting to changing environments
- Control machine learning tools and their application in data mining for decision making
- Employ Autoencoders, GANs and Diffusion Models to solve specific challenges in Artificial Intelligence
- Implement an encoder-decoder network for neural machine translation
- Apply the fundamental principles of neural networks in solving specific problems
- Using AI tools in oral health monitoring, oral disease prevention and effective integration of these technologies in dental practice
- Master the latest AI technologies applied in 3D printing, robotics, clinical management, tele-dentistry and automation of administrative tasks
- Use AI to analyze patient feedback, improve dental CRM and marketing strategies, and optimize clinical and administrative management in dental clinics
- Use AI for planning and 3D modeling of orthodontic treatments
- Handle large datasets, using Big Data concepts, data mining, predictive analytics and machine learning algorithms

Specific Skills

- Apply AI techniques and strategies to improve efficiency in the *retail* sector
- Delve into understanding and application of genetic algorithms
- Implement noise removal techniques using automatic encoders
- Effectively create training data sets for natural language processing (NLP) tasks
- Run grouping layers and their use in *Deep Computer Vision* models with Keras
- Use *TensorFlow* features and graphics to optimize the performance of custom models
- Optimize the development and application of *chatbots* and virtual assistants, understanding their operation and potential applications
- Master reuse of pre-workout layers to optimize and accelerate the training process
- Build the first neural network, applying the concepts learned in practice
- Activate Multilayer Perceptron (MLP) using the Keras library
- Apply data scanning and preprocessing techniques, identifying and preparing data for effective use in machine learning models
- Implement effective strategies for handling missing values in datasets, applying imputation or elimination methods according to context
- Investigate languages and software for the creation of ontologies, using specific tools for the development of semantic models
- Develop data cleaning techniques to ensure the quality and accuracy of the information used in subsequent analyses
- Apply AI for the accurate diagnosis of oral diseases, including dental image interpretation and pathology detection
- Utilize AI tools in oral health monitoring and oral disease prevention, effectively integrating these technologies into the dental practice
- Use AI to analyze patient *feedback*, improve dental marketing and CRM strategies, and optimize clinical and administrative management in dental clinics
- Using AI tools for monitoring oral health trends and patterns, as well as for cost analysis in dentistry, contributing to a more efficient and data-driven management in the clinical environment

Thanks to the application of Artificial Intelligence, you will optimize diagnoses and treatments, revolutionizing the dental practice with precision and efficiency"

04

Course Management

The faculty of this program are multidisciplinary experts, who combine a deep knowledge in Artificial Intelligence with a solid experience in Dentistry. In fact, these highly qualified professionals have an extensive track record in the development and implementation of cutting-edge technologies in the dental field. In addition, your commitment to ethics and responsibility in the application of AI in Dentistry will ensure that graduates gain a thorough understanding of the ethical challenges and opportunities associated with the application of these innovative technologies in clinical practice.

You will merge technical knowledge with the direct application of Artificial Intelligence in the dental context, hand in hand with top experts"

Management

Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometeus Global Solutions
- CTO at Korporate Technologies
- CTO at AI Shephers GmbH
- Consultant and Strategic Business Advisor at Alliance Medical
- Director of Design and Development at DocPath
- PhD in Psychology from the University of Castilla - La Mancha
- PhD in Economics, Business and Finance from the Camilo José Cela University
- PhD in Psychology from University of Castilla – La Mancha
- Professional Master's Degree in Executive MBA by the Isabel I University
- Professional Master's Degree in Sales and Marketing Management, Isabel I University
- Expert Master's Degree in Big Data by Hadoop Training
- Professional Master's Degree in Advanced Information Technologies from the University of Castilla - La Mancha
- Member of: SMILE Research Group

Dr. Martín-Palomino Sahagún, Patricia

- Private Orthodontist
- Researcher
- Doctor of Dentistry, Alfonso X El Sabio University
- Postgraduate degree in Orthodontics from the Alfonso X El Sabio University
- Degree in Dentistry from the University Alfonso X El Sabio

Professors

Dr. Carrasco González, Ramón Alberto

- Researcher
- Head of Business Intelligence (Marketing) at Caja General de Ahorros de Granada and Banco Mare Nostrum.
- Head of Information Systems (Data Warehousing and Business Intelligence) at Caja General de Ahorros de Granada and Banco Mare Nostrum
- PhD in Artificial Intelligence from the University of Granada
- Degree in Computer Engineering from the University of Granada

Mr. Popescu Radu, Daniel Vasile

- Freelance Producer of Teaching and Scientific Contents
- Nutritionist and Community Dietitian
- Community Pharmacist
- Researcher
- Master's Degree in Nutrition and Health at the Open University of Catalonia
- Master's Degree in Psychopharmacology from the University of Valencia
- Pharmacist by the Complutense University of Madrid
- Nutritionist-Dietician by the European University Miguel de Cervantes

05

Structure and Content

The program is distinguished by its uniqueness by comprehensively and progressively addressing each key aspect of the integration of Artificial Intelligence in Dentistry. From the basics of *Machine Learning* and data analysis, to the most advanced applications such as 3D printing, robotics and clinical management, this program will offer a thorough understanding of the technological evolution in the dental field. This balanced approach between theory and practice will thus prepare professionals to lead the responsible and effective adoption of AI in Dentistry, boosting the quality and precision of oral care.

TECH offers you a unique training, preparing you to adopt advanced technologies, as well as to lead the digital and ethical transformation of the dental practice"

Module 1. Fundamentals of Artificial Intelligence

1.1. History of Artificial Intelligence
- 1.1.1. When Do We Start Talking About Artificial Intelligence?
- 1.1.2. References in Film
- 1.1.3. Importance of Artificial Intelligence
- 1.1.4. Technologies that Enable and Support Artificial Intelligence

1.2. Artificial Intelligence in Games
- 1.2.1. Game Theory
- 1.2.2. Minimax and Alpha-Beta Pruning
- 1.2.3. Simulation: Monte Carlo

1.3. Neural Networks
- 1.3.1. Biological Fundamentals
- 1.3.2. Computational Model
- 1.3.3. Supervised and Unsupervised Neural Networks
- 1.3.4. Simple Perceptron
- 1.3.5. Multilayer Perceptron

1.4. Genetic Algorithms
- 1.4.1. History
- 1.4.2. Biological Basis
- 1.4.3. Problem Coding
- 1.4.4. Generation of the Initial Population
- 1.4.5. Main Algorithm and Genetic Operators
- 1.4.6. Evaluation of Individuals: Fitness

1.5. Thesauri, Vocabularies, Taxonomies
- 1.5.1. Vocabulary
- 1.5.2. Taxonomy
- 1.5.3. Thesauri
- 1.5.4. Ontologies
- 1.5.5. Knowledge Representation Semantic Web

1.6. Semantic Web
- 1.6.1. Specifications RDF, RDFS and OWL
- 1.6.2. Inference/ Reasoning
- 1.6.3. Linked Data

1.7. Expert Systems and DSS
- 1.7.1. Expert Systems
- 1.7.2. Decision Support Systems

1.8. Chatbots and Virtual Assistants
- 1.8.1. Types of Assistants: Voice and Text-based Assistants
- 1.8.2. Fundamental Parts for the Development of an Assistant: Intents, Entities and Dialog Flow
- 1.8.3. Integrations: Web, Slack, WhatsApp, Facebook
- 1.8.4. Assistant Development Tools: Dialog Flow, Watson Assistant

1.9. AI Implementation Strategy

1.10. Future of Artificial Intelligence
- 1.10.1. Understand How to Detect Emotions Using Algorithms
- 1.10.2. Creation of a Personality: Language, Expressions and Content
- 1.10.3. Trends of Artificial Intelligence
- 1.10.4. Reflections

Module 2. Data Types and Data Life Cycle

2.1. Statistics
- 2.1.1. Statistics: Descriptive Statistics, Statistical Inferences
- 2.1.2. Population, Sample, Individual
- 2.1.3. Variables: Definition, Measurement Scales

2.2. Types of Data Statistics
- 2.2.1. According to Type
  - 2.2.1.1. Quantitative: Continuous Data and Discrete Data
  - 2.2.1.2. Qualitative: Binomial Data, Nominal Data and Ordinal Data

2.2.2. According to their Shape
2.2.2.1. Numeric
2.2.2.2. Text:
2.2.2.3. Logical
2.2.3. According to its Source
2.2.3.1. Primary
2.2.3.2. Secondary
2.3. Life Cycle of Data
2.3.1. Stages of the Cycle
2.3.2. Milestones of the Cycle
2.3.3. FAIR Principles
2.4. Initial Stages of the Cycle
2.4.1. Definition of Goals
2.4.2. Determination of Resource Requirements
2.4.3. Gantt Chart
2.4.4. Data Structure
2.5. Data Collection
2.5.1. Methodology of Data Collection
2.5.2. Data Collection Tools
2.5.3. Data Collection Channels
2.6. Data Cleaning
2.6.1. Phases of Data Cleansing
2.6.2. Data Quality
2.6.3. Data Manipulation (with R)
2.7. Data Analysis, Interpretation and Evaluation of Results
2.7.1. Statistical Measures
2.7.2. Relationship Indices
2.7.3. Data Mining
2.8. Data Warehouse (*Datawarehouse*)
2.8.1. Elements that Comprise it
2.8.2. Design
2.8.3. Aspects to Consider
2.9. Data Availability
2.9.1. Access
2.9.2. Uses
2.9.3. Security/Safety
2.10. Regulatory Aspects
2.10.1. Data Protection Law
2.10.2. Good Practices
2.10.3. Other Normative Aspects

Module 3. Data in Artificial Intelligence

3.1. Data Science
3.1.1. Data Science
3.1.2. Advanced Tools for Data Scientists
3.2. Data, Information and Knowledge
3.2.1. Data, Information and Knowledge
3.2.2. Types of Data
3.2.3. Data Sources
3.3. From Data to Information
3.3.1. Data Analysis
3.3.2. Types of Analysis
3.3.3. Extraction of Information from a *Dataset*
3.4. Extraction of Information Through Visualization
3.4.1. Visualization as an Analysis Tool
3.4.2. Visualization Methods
3.4.3. Visualization of a Data Set

3.5. Data Quality
- 3.5.1. Quality Data
- 3.5.2. Data Cleaning
- 3.5.3. Basic Data Pre-Processing

3.6. *Dataset*
- 3.6.1. *Dataset* Enrichment
- 3.6.2. The Curse of Dimensionality
- 3.6.3. Modification of Our Data Set

3.7. Unbalance
- 3.7.1. Classes of Unbalance
- 3.7.2. Unbalance Mitigation Techniques
- 3.7.3. Balancing a *Dataset*

3.8. Unsupervised Models
- 3.8.1. Unsupervised Model
- 3.8.2. Methods
- 3.8.3. Classification with Unsupervised Models

3.9. Supervised Models
- 3.9.1. Supervised Model
- 3.9.2. Methods
- 3.9.3. Classification with Supervised Models

3.10. Tools and Good Practices
- 3.10.1. Good Practices for Data Scientists
- 3.10.2. The Best Model
- 3.10.3. Useful Tools

Module 4. Data Mining. Selection, Pre-Processing and Transformation

4.1. Statistical Inference
- 4.1.1. Descriptive Statistics vs. Statistical Inference
- 4.1.2. Parametric Procedures
- 4.1.3. Non-Parametric Procedures

4.2. Exploratory Analysis
- 4.2.1. Descriptive Analysis
- 4.2.2. Visualization
- 4.2.3. Data Preparation

4.3. Data Preparation
- 4.3.1. Integration and Data Cleaning
- 4.3.2. Normalization of Data
- 4.3.3. Transforming Attributes

4.4. Missing Values
- 4.4.1. Treatment of Missing Values
- 4.4.2. Maximum Likelihood Imputation Methods
- 4.4.3. Missing Value Imputation Using Machine Learning

4.5. Noise in the Data
- 4.5.1. Noise Classes and Attributes
- 4.5.2. Noise Filtering
- 4.5.3. The Effect of Noise

4.6. The Curse of Dimensionality
- 4.6.1. *Oversampling*
- 4.6.2. *Undersampling*
- 4.6.3. Multidimensional Data Reduction

4.7. From Continuous to Discrete Attributes
- 4.7.1. Continuous Data Vs. Discreet Data
- 4.7.2. Discretization Process

4.8. The Data
- 4.8.1. Data Selection
- 4.8.2. Prospects and Selection Criteria
- 4.8.3. Selection Methods

4.9. Instance Selection
- 4.9.1. Methods for Instance Selection
- 4.9.2. Prototype Selection
- 4.9.3. Advanced Methods for Instance Selection

4.10. Data Pre-Processing in Big Data Environments

Module 5. Algorithm and Complexity in Artificial Intelligence

5.1. Introduction to Algorithm Design Strategies
- 5.1.1. Recursion
- 5.1.2. Divide and Conquer
- 5.1.3. Other Strategies

5.2. Efficiency and Analysis of Algorithms
- 5.2.1. Efficiency Measures
- 5.2.2. Measuring the Size of the Input
- 5.2.3. Measuring Execution Time
- 5.2.4. Worst, Best and Average Case
- 5.2.5. Asymptotic Notation
- 5.2.6. Criteria for Mathematical Analysis of Non-Recursive Algorithms
- 5.2.7. Mathematical Analysis of Recursive Algorithms
- 5.2.8. Empirical Analysis of Algorithms

5.3. Sorting Algorithms
- 5.3.1. Concept of Sorting
- 5.3.2. Bubble Sorting
- 5.3.3. Sorting by Selection
- 5.3.4. Sorting by Insertion
- 5.3.5. *Merge Sort*
- 5.3.6. *Quick Sort*

5.4. Algorithms with Trees
- 5.4.1. Tree Concept
- 5.4.2. Binary Trees
- 5.4.3. Tree Paths
- 5.4.4. Representing Expressions
- 5.4.5. Ordered Binary Trees
- 5.4.6. Balanced Binary Trees

5.5. Algorithms Using *Heaps*
- 5.5.1. *Heaps*
- 5.5.2. The *Heapsort* Algorithm
- 5.5.3. Priority Queues

5.6. Graph Algorithms
- 5.6.1. Representation
- 5.6.2. Traversal in Width
- 5.6.3. Depth Travel
- 5.6.4. Topological Sorting

5.7. *Greedy* Algorithms
- 5.7.1. *Greedy* Strategy
- 5.7.2. Elements of the *Greedy* Strategy
- 5.7.3. Currency Exchange
- 5.7.4. Traveler's Problem
- 5.7.5. Backpack Problem

5.8. Minimal Path Finding
- 5.8.1. The Minimum Path Problem
- 5.8.2. Negative Arcs and Cycles
- 5.8.3. Dijkstra's Algorithm

5.9. *Greedy* Algorithms on Graphs
- 5.9.1. The Minimum Covering Tree
- 5.9.2. Prim's Algorithm
- 5.9.3. Kruskal's Algorithm
- 5.9.4. Complexity Analysis

5.10. *Backtracking*
- 5.10.1. *Backtracking*
- 5.10.2. Alternative Techniques

Module 6. Intelligent Systems

6.1. Agent Theory
- 6.1.1. Concept History
- 6.1.2. Agent Definition
- 6.1.3. Agents in Artificial Intelligence
- 6.1.4. Agents in Software Engineering

6.2. Agent Architectures
- 6.2.1. The Reasoning Process of an Agent
- 6.2.2. Reactive Agents
- 6.2.3. Deductive Agents
- 6.2.4. Hybrid Agents
- 6.2.5. Comparison

6.3. Information and Knowledge
- 6.3.1. Difference between Data, Information and Knowledge
- 6.3.2. Data Quality Assessment
- 6.3.3. Data Collection Methods
- 6.3.4. Information Acquisition Methods
- 6.3.5. Knowledge Acquisition Methods

6.4. Knowledge Representation
- 6.4.1. The Importance of Knowledge Representation
- 6.4.2. Definition of Knowledge Representation According to Roles
- 6.4.3. Knowledge Representation Features

6.5. Ontologies
- 6.5.1. Introduction to Metadata
- 6.5.2. Philosophical Concept of Ontology
- 6.5.3. Computing Concept of Ontology
- 6.5.4. Domain Ontologies and Higher-Level Ontologies
- 6.5.5. How to Build an Ontology?

6.6. Ontology Languages and Ontology Creation Software
- 6.6.1. Triple RDF, *Turtle* and N
- 6.6.2. RDF *Schema*
- 6.6.3. OWL
- 6.6.4. SPARQL
- 6.6.5. Introduction to Ontology Creation Tools
- 6.6.6. Installing and Using *Protégé*

6.7. Semantic Web
- 6.7.1. Current and Future Status of the Semantic Web
- 6.7.2. Semantic Web Applications

6.8. Other Knowledge Representation Models
- 6.8.1. Vocabulary
- 6.8.2. Global Vision
- 6.8.3. Taxonomy
- 6.8.4. Thesauri
- 6.8.5. Folksonomy
- 6.8.6. Comparison
- 6.8.7. Mind Maps

6.9. Knowledge Representation Assessment and Integration
- 6.9.1. Zero-Order Logic
- 6.9.2. First-Order Logic
- 6.9.3. Descriptive Logic
- 6.9.4. Relationship between Different Types of Logic
- 6.9.5. *Prolog*: Programming Based on First-Order Logic

6.10. Semantic Reasoners, Knowledge-Based Systems and Expert Systems
- 6.10.1. Concept of Reasoner
- 6.10.2. Reasoner Applications
- 6.10.3. Knowledge-Based Systems
- 6.10.4. MYCIN: History of Expert Systems
- 6.10.5. Expert Systems Elements and Architecture
- 6.10.6. Creating Expert Systems

Module 7. Machine Learning and Data Mining

7.1. Introduction to Knowledge Discovery Processes and Basic Concepts of Machine Learning
- 7.1.1. Key Concepts of Knowledge Discovery Processes
- 7.1.2. Historical Perspective of Knowledge Discovery Processes
- 7.1.3. Stages of the Knowledge Discovery Processes
- 7.1.4. Techniques Used in Knowledge Discovery Processes
- 7.1.5. Characteristics of Good Machine Learning Models
- 7.1.6. Types of Machine Learning Information
- 7.1.7. Basic Learning Concepts
- 7.1.8. Basic Concepts of Unsupervised Learning

7.2. Data Exploration and Pre-processing
- 7.2.1. Data Processing
- 7.2.2. Data Processing in the Data Analysis Flow
- 7.2.3. Types of Data
- 7.2.4. Data Transformations
- 7.2.5. Visualization and Exploration of Continuous Variables
- 7.2.6. Visualization and Exploration of Categorical Variables
- 7.2.7. Correlation Measures
- 7.2.8. Most Common Graphic Representations
- 7.2.9. Introduction to Multivariate Analysis and Dimensionality Reduction

7.3. Decision Trees
- 7.3.1. ID Algorithm
- 7.3.2. Algorithm C
- 7.3.3. Overtraining and Pruning
- 7.3.4. Analysis of Results

7.4. Evaluation of Classifiers
- 7.4.1. Confusion Matrixes
- 7.4.2. Numerical Evaluation Matrixes
- 7.4.3. Kappa Statistic
- 7.4.4. ROC Curves

7.5. Classification Rules
- 7.5.1. Rule Evaluation Measures
- 7.5.2. Introduction to Graphic Representation
- 7.5.3. Sequential Overlay Algorithm

7.6. Neural Networks
- 7.6.1. Basic Concepts
- 7.6.2. Simple Neural Networks
- 7.6.3. *Backpropagation* Algorithm
- 7.6.4. Introduction to Recurrent Neural Networks

7.7. Bayesian Methods
- 7.7.1. Basic Probability Concepts
- 7.7.2. Bayes' Theorem
- 7.7.3. Naive Bayes
- 7.7.4. Introduction to Bayesian Networks

7.8. Regression and Continuous Response Models
- 7.8.1. Simple Linear Regression
- 7.8.2. Multiple Linear Regression
- 7.8.3. Logistic Regression
- 7.8.4. Regression Trees
- 7.8.5. Introduction to Support Vector Machines (SVM)
- 7.8.6. Goodness-of-Fit Measures

7.9. *Clustering*
- 7.9.1. Basic Concepts
- 7.9.2. Hierarchical *Clustering*
- 7.9.3. Probabilistic Methods
- 7.9.4. EM Algorithm
- 7.9.5. *B-Cubed* Method
- 7.9.6. Implicit Methods

7.10. Text Mining and Natural Language Processing (NLP)
- 7.10.1. Basic Concepts
- 7.10.2. Corpus Creation
- 7.10.3. Descriptive Analysis
- 7.10.4. Introduction to Feelings Analysis

Module 8. Neural Networks, the Basis of *Deep Learning*

8.1. Deep Learning
- 8.1.1. Types of Deep Learning
- 8.1.2. Applications of Deep Learning
- 8.1.3. Advantages and Disadvantages of Deep Learning

8.2. Surgery
- 8.2.1. Sum
- 8.2.2. Product
- 8.2.3. Transfer

8.3. Layers
- 8.3.1. Input Layer
- 8.3.2. Cloak
- 8.3.3. Output Layer

8.4. Layer Bonding and Operations
- 8.4.1. Architecture Design
- 8.4.2. Connection between Layers
- 8.4.3. Forward Propagation

8.5. Construction of the First Neural Network
- 8.5.1. Network Design
- 8.5.2. Establish the Weights
- 8.5.3. Network Training

8.6. Trainer and Optimizer
- 8.6.1. Optimizer Selection
- 8.6.2. Establishment of a Loss Function
- 8.6.3. Establishing a Metric

8.7. Application of the Principles of Neural Networks
- 8.7.1. Activation Functions
- 8.7.2. Backward Propagation
- 8.7.3. Parameter Adjustment

8.8. From Biological to Artificial Neurons
- 8.8.1. Functioning of a Biological Neuron
- 8.8.2. Transfer of Knowledge to Artificial Neurons
- 8.8.3. Establish Relations between the Two

8.9. Implementation of MLP (Multilayer Perceptron) with Keras
- 8.9.1. Definition of the Network Structure
- 8.9.2. Model Compilation
- 8.9.3. Model Training

8.10. *Fine Tuning* Hyperparameters of Neural Networks
- 8.10.1. Selection of the Activation Function
- 8.10.2. Set the *Learning* Rate
- 8.10.3. Adjustment of Weights

Module 9. Deep Neural Networks Training

9.1. Gradient Problems
- 9.1.1. Gradient Optimization Techniques
- 9.1.2. Stochastic Gradients
- 9.1.3. Weight Initialization Techniques

9.2. Reuse of Pre-Trained Layers
- 9.2.1. Learning Transfer Training
- 9.2.2. Feature Extraction
- 9.2.3. Deep Learning

9.3. Optimizers
- 9.3.1. Stochastic Gradient Descent Optimizers
- 9.3.2. Optimizers Adam and *RMSprop*
- 9.3.3. Moment Optimizers

9.4. Learning Rate Programming
- 9.4.1. Automatic Learning Rate Control
- 9.4.2. Learning Cycles
- 9.4.3. Smoothing Terms

9.5. Overfitting
- 9.5.1. Cross Validation
- 9.5.2. Regularization
- 9.5.3. Evaluation Metrics

9.6. Practical Guidelines
- 9.6.1. Model Design
- 9.6.2. Selection of Metrics and Evaluation Parameters
- 9.6.3. Hypothesis Testing

9.7. *Transfer Learning*
- 9.7.1. Learning Transfer Training
- 9.7.2. Feature Extraction
- 9.7.3. Deep Learning

9.8. *Data Augmentation*
- 9.8.1. Image Transformations
- 9.8.2. Synthetic Data Generation
- 9.8.3. Text Transformation

9.9. Practical Application of Transfer Learning
- 9.9.1. Learning Transfer Training
- 9.9.2. Feature Extraction
- 9.9.3. Deep Learning

9.10. Regularization
- 9.10.1. L and L
- 9.10.2. Regularization by Maximum Entropy
- 9.10.3. *Dropout*

Module 10. Model Customization and Training with *TensorFlow*

10.1. *TensorFlow*
- 10.1.1. Use of the *TensorFlow* Library
- 10.1.2. Model Training with *TensorFlow*
- 10.1.3. Operations with Graphics in *TensorFlow*

10.2. *TensorFlow* and NumPy
- 10.2.1. NumPy Computing Environment for *TensorFlow*
- 10.2.2. Using NumPy Arrays with *TensorFlow*
- 10.2.3. NumPy Operations for TensorFlow Graphics

10.3. Model Customization and Training Algorithms
- 10.3.1. Building Custom Models with TensorFlow
- 10.3.2. Management of Training Parameters
- 10.3.3. Use of Optimization Techniques for Training

10.4. TensorFlow Features and Graphics
- 10.4.1. Functions with TensorFlow
- 10.4.2. Use of Graphs for Model Training
- 10.4.3. Graphics Optimization with TensorFlowOperations

10.5. Loading and Preprocessing Data with TensorFlow
- 10.5.1. Loading Data Sets with TensorFlow
- 10.5.2. Preprocessing Data with TensorFlow
- 10.5.3. Using TensorFlow Tools for Data Manipulation

10.6. The API tfdata
- 10.6.1. Using the tfdataAPI for Data Processing
- 10.6.2. Construction of Data Streams with tfdata
- 10.6.3. Using the tfdata API for Model Training

10.7. The TFRecord Format
- 10.7.1. Using the TFRecord API for Data Serialization
- 10.7.2. TFRecord Files Upload with TensorFlow
- 10.7.3. Using TFRecord Files for Model Training

10.8. Keras Preprocessing Layers
- 10.8.1. Using the Keras Preprocessing API
- 10.8.2. Preprocessing pipelined Construction with Keras
- 10.8.3. Using the Keras Preprocessing API for Model Training

10.9. The TensorFlow Datasets Project
- 10.9.1. Using TensorFlow Datasets for Data Loading
- 10.9.2. Preprocessing Data with TensorFlow Datasets
- 10.9.3. Using TensorFlow Datasets for Model Training

10.10. Building a Deep Learning App with TensorFlow
- 10.10.1. Practical Applications
- 10.10.2. Building a Deep Learning App with TensorFlow
- 10.10.3. Model Training with TensorFlow
- 10.10.4. Use of the Application for the Prediction of Results

Module 11. *Deep Computer Vision* with Convolutional Neural Networks

11.1. The *Visual Cortex* Architecture
- 11.1.1. Functions of the Visual Cortex
- 11.1.2. Theories of Computational Vision
- 11.1.3. Models of Image Processing

11.2. Convolutional Layers
- 11.2.1. Reuse of Weights in Convolution
- 11.2.2. Convolution D
- 11.2.3. Activation Functions

11.3. Grouping Layers and Implementation of Grouping Layers with Keras
- 11.3.1. Pooling and Striding
- 11.3.2. *Flattening*
- 11.3.3. Types of *Pooling*

11.4. CNN Architecture
- 11.4.1. VGG Architecture
- 11.4.2. *AlexNet* Architecture
- 11.4.3. Architecture *ResNet*

11.5. Implementing a CNN *ResNet* using Keras
- 11.5.1. Weight Initialization
- 11.5.2. Input Layer Definition
- 11.5.3. Output Definition

11.6. Use of Pre-trained Keras Models
- 11.6.1. Characteristics of Pre-trained Models
- 11.6.2. Uses of Pre-trained Models
- 11.6.3. Advantages of Pre-trained Models

11.7. Pre-trained Models for Transfer Learning
- 11.7.1. Transfer Learning
- 11.7.2. Transfer Learning Process
- 11.7.3. Advantages of Transfer Learning

11.8. *Deep Computer Vision* Classification and Localization
- 11.8.1. Image Classification
- 11.8.2. Localization of Objects in Images
- 11.8.3. Object Detection

11.9. Object Detection and Object Tracking
- 11.9.1. Object Detection Methods
- 11.9.2. Object Tracking Algorithms
- 11.9.3. Tracking and Localization Techniques

11.10. Semantic Segmentation
- 11.10.1. Deep Learning for Semantic Segmentation
- 11.10.2. Edge Detection
- 11.10.3. Rule-based Segmentation Methods

Module 12. Natural Language Processing (NLP) with Natural Recurrent Networks (NNN) and Attention

12.1. Text Generation using RNN
- 12.1.1. Training an RNN for Text Generation
- 12.1.2. Natural Language Generation with RNN
- 12.1.3. Text Generation Applications with RNN

12.2. Training Data Set Creation
- 12.2.1. Preparation of the Data for Training an RNN
- 12.2.2. Storage of the Training Dataset
- 12.2.3. Data Cleaning and Transformation
- 12.2.4. Sentiment Analysis

12.3. Classification of Opinions with RNN
- 12.3.1. Detection of Themes in Comments
- 12.3.2. Sentiment Analysis with Deep Learning Algorithms

12.4. Encoder-decoder Network for Neural Machine Translation
- 12.4.1. Training an RNN for Machine Translation
- 12.4.2. Use of an *Encoder-decoder* Network for Machine Translation
- 12.4.3. Improving the Accuracy of Machine Translation with RNNs

12.5. Attention Mechanisms
- 12.5.1. Application of Care Mechanisms in RNN
- 12.5.2. Use of Care Mechanisms to Improve the Accuracy of the Models
- 12.5.3. Advantages of Attention Mechanisms in Neural Networks

12.6. *Transformers* Models
- 12.6.1. Using *Transformers*Models for Natural Language Processing
- 12.6.2. Application of *Transformers* Models for Vision
- 12.6.3. Advantages of *Transformers* Models

12.7. *Transformers* for Vision
- 12.7.1. Use of *Transformers* Models for Vision
- 12.7.2. Image Data Preprocessing
- 12.7.3. Training a *Transformers* Model for Vision

12.8. *Hugging Face's Transformers*Bookstore
- 12.8.1. Using the *Hugging Face's Transformers*Library
- 12.8.2. *Hugging Face´s Transformers* Library App
- 12.8.3. Advantages of *Hugging Face´s Transformers* Library

12.9. Other *Transformers* Libraries. Comparison
- 12.9.1. Comparison between Different *Transformers*Libraries
- 12.9.2. Use of the Other *Transformers* Libraries
- 12.9.3. Advantages of the Other *Transformers* Libraries

12.10. Development of an NLP Application with RNN and Attention. Practical Applications
- 12.10.1. Development of a Natural Language Processing Application with RNN and Attention
- 12.10.2. Use of RNN, Attention Mechanisms and *Transformers* Models in the Application
- 12.10.3. Evaluation of the Practical Application

Module 13. *Autoencoders*, *GANs* and Diffusion Models

13.1. Representation of Efficient Data
- 13.1.1. Dimensionality Reduction
- 13.1.2. Deep Learning
- 13.1.3. Compact Representations

13.2. PCA Realization with an Incomplete Linear Automatic Encoder
- 13.2.1. Training Process
- 13.2.2. Implementation in Python
- 13.2.3. Use of Test Data

13.3. Stacked Automatic Encoders
- 13.3.1. Deep Neural Networks
- 13.3.2. Construction of Coding Architectures
- 13.3.3. Use of Regularization

13.4. Convolutional Autoencoders
- 13.4.1. Design of Convolutional Models
- 13.4.2. Convolutional Model Training
- 13.4.3. Results Evaluation

13.5. Automatic Encoder Denoising
- 13.5.1. Application of Filters
- 13.5.2. Design of Coding Models
- 13.5.3. Use of Regularization Techniques

13.6. Sparse Automatic Encoders
- 13.6.1. Increasing Coding Efficiency
- 13.6.2. Minimizing the Number of Parameters
- 13.6.3. Using Regularization Techniques

13.7. Variational Automatic Encoders
- 13.7.1. Use of Variational Optimization
- 13.7.2. Unsupervised Deep Learning
- 13.7.3. Deep Latent Representations

13.8. Generation of Fashion MNIST Images
- 13.8.1. Pattern Recognition
- 13.8.2. Image Generation
- 13.8.3. Deep Neural Networks Training

13.9. Generative Adversarial Networks and Diffusion Models
- 13.9.1. Content Generation from Images
- 13.9.2. Modeling of Data Distributions
- 13.9.3. Use of Adversarial Networks

13.10. Implementation of the Models
- 13.10.1. Practical Application
- 13.10.2. Implementation of the Models
- 13.10.3. Use of Real Data
- 13.10.4. Results Evaluation

Module 14. Bio-Inspired Computing

14.1. Introduction to Bio-Inspired Computing
- 14.1.1. Introduction to Bio-Inspired Computing

14.2. Social Adaptation Algorithms
- 14.2.1. Bio-Inspired Computation Based on Ant Colonies
- 14.2.2. Variants of Ant Colony Algorithms
- 14.2.3. Particle Cloud Computing

14.3. Genetic Algorithms
- 14.3.1. General Structure
- 14.3.2. Implementations of the Major Operators

14.4. Space Exploration-Exploitation Strategies for Genetic Algorithms
- 14.4.1. CHC Algorithm
- 14.4.2. Multimodal Problems

14.5. Evolutionary Computing Models (I)
- 14.5.1. Evolutionary Strategies
- 14.5.2. Evolutionary Programming
- 14.5.3. Algorithms Based on Differential Evolution

14.6. Evolutionary Computation Models (II)
- 14.6.1. Evolutionary Models Based on Estimation of Distributions (EDA)
- 14.6.2. Genetic Programming

14.7. Evolutionary Programming Applied to Learning Problems
- 14.7.1. Rules-Based Learning
- 14.7.2. Evolutionary Methods in Instance Selection Problems

14.8. Multi-Objective Problems
- 14.8.1. Concept of Dominance
- 14.8.2. Application of Evolutionary Algorithms to Multi-Objective Problems

14.9. Neural Networks (I)
- 14.9.1. Introduction to Neural Networks
- 14.9.2. Practical Example with Neural Networks

14.10. Neural Networks (II)
- 14.10.1. Use Cases of Neural Networks in Medical Research
- 14.10.2. Use Cases of Neural Networks in Economics
- 14.10.3. Use Cases of Neural Networks in Artificial Vision

Module 15. Artificial Intelligence: Strategies and Applications

15.1. Financial Services
- 15.1.1. The implications of Artificial Intelligence (AI) in financial services. Opportunities and challenges
- 15.1.2. Case Uses
- 15.1.3. Potential Risks Related to the Use of AI
- 15.1.4. Potential Future Developments/uses of AI

15.2. Implications of Artificial Intelligence in the Healthcare Service
- 15.2.1. Implications of AI in the Healthcare Sector. Opportunities and Challenges
- 15.2.2. Case Uses

15.3. Risks Related to the Use of AI in the Health Service
- 15.3.1. Potential Risks Related to the Use of AI
- 15.3.2. Potential Future Developments/uses of AI

15.4. *Retail*
- 15.4.1. Implications of AI in *Retail*. Opportunities and Challenges
- 15.4.2. Case Uses
- 15.4.3. Potential Risks Related to the Use of AI
- 15.4.4. Potential Future Developments/uses of AI

15.5. Industry
- 15.5.1. Implications of AI in Industry. Opportunities and Challenges
- 15.5.2. Case Uses

15.6. Potential Risks Related to the Use of AI in Industry
- 15.6.1. Case Uses
- 15.6.2. Potential Risks Related to the Use of AI
- 15.6.3. Potential Future Developments/uses of AI

15.7. Public Administration
- 15.7.1. AI Implications for Public Administration. Opportunities and Challenges
- 15.7.2. Case Uses
- 15.7.3. Potential Risks Related to the Use of AI
- 15.7.4. Potential Future Developments/uses of AI

15.8. Educational
- 15.8.1. AI Implications for Education. Opportunities and Challenges
- 15.8.2. Case Uses
- 15.8.3. Potential Risks Related to the Use of AI
- 15.8.4. Potential Future Developments/uses of AI

15.9. Forestry and Agriculture
- 15.9.1. Implications of AI in Forestry and Agriculture. Opportunities and Challenges
- 15.9.2. Case Uses
- 15.9.3. Potential Risks Related to the Use of AI
- 15.9.4. Potential Future Developments/uses of AI

15.10. Human Resources
- 15.10.1. Implications of AI for Human Resources Opportunities and Challenges
- 15.10.2. Case Uses
- 15.10.3. Potential Risks Related to the Use of AI
- 15.10.4. Potential Future Developments/uses of AI

Module 16. Monitoring and Control of Dental Health using AI

16.1. AI Applications for Patient's Dental Health Management
- 16.1.1. Design of Mobile Applications for Dental Hygiene Monitoring
- 16.1.2. AI Systems for the Early Detection of Caries and Periodontal Diseases
- 16.1.3. Use of AI in the Personalization of Dental Treatments
- 16.1.4. Image Recognition Technologies for Automated Dental Diagnostics

16.2. Integration of Clinical and Biomedical Information as a Basis for Dental Health Monitoring
- 16.2.1. Platforms for Integration of Clinical and Radiographic Data
- 16.2.2. Analysis of Medical Records to Identify Dental Risks
- 16.2.3. Systems for Correlating Biomedical Data with Dental Conditions
- 16.2.4. Tools for the Unified Management of Patient Information

16.3. Definition of Indicators for the Control of the Patient's Dental Health
- 16.3.1. Establishment of Parameters for the Evaluation of Oral Health
- 16.3.2. Systems for Monitoring Progress in Dental Treatments
- 16.3.3. Development of Risk Indexes for Dental Disease
- 16.3.4. AI Methods for the Prediction of Future Dental Problems

16.4. Natural Language Processing of Dental Health Records for Indicator Extraction
- 16.4.1. Automatic Extraction of Relevant Data from Dental Records
- 16.4.2. Analysis of Clinical Notes to Identify Dental Health Trends
- 16.4.3. Use of NLP to Summarize Long Medical Records
- 16.4.4. Early Warning Systems Based on Clinical Text Analysis

16.5. AI Tools for the Monitoring and Control of Dental Health Indicators
- 16.5.1. Development of Applications for Monitoring Oral Hygiene and Oral Health

16.5.2. AI-based Personalized Patient Alerts Systems
16.5.3. Analytical Tools for Continuous Assessment of Dental Health
16.5.4. Use of Wearables and Sensors for Real-Time Dental Monitoring
16.6. Development of *Dashboards* for the Monitoring of Dental Indicators
16.6.1. Creation of Intuitive Interfaces for Dental Health Monitoring
16.6.2. Integration of Data from Different Clinical Sources into a Single *Dashboard*
16.6.3. Data Visualization Tools for Treatment Monitoring
16.6.4. Customization of *Dashboards* According to the Needs of the Dental Professional
16.7. Interpretation of Dental Health Indicators and Decision Making
16.7.1. Data-driven Clinical Decision Support Systems
16.7.2. Predictive Analytics for Dental Treatment Planning
16.7.3. AI for Interpretation of Complex Oral Health Indicators
16.7.4. Tools for the Evaluation of Treatment Effectiveness
16.8. Generation of Dental Health Reports using AI Tools
16.8.1. Automation of the Creation of Detailed Dental Reports
16.8.2. Customized Report Generation Systems for Patients
16.8.3. AI Tools for Summarizing Clinical Findings
16.8.4. Integration of Clinical and Radiological Data into Automated Reports
16.9. AI-enabled Platforms for Patient Monitoring of Dental Health
16.9.1. Applications for Oral Health Self-monitoring
16.9.2. AI-based Interactive Dental Education Platforms
16.9.3. Tools for Symptom Tracking and Personalized Dental Advice
16.9.4. Gamification Systems to Encourage Good Dental Hygiene Habits
16.10. Security and Privacy in the Treatment of Dental Information
16.10.1. Security Protocols for the Protection of Patient Data
16.10.2. Encryption and Anonymization Systems in the Management of Clinical Data
16.10.3. Regulations and Legal Compliance in the Management of Dental Information
16.10.4. Privacy Education and Awareness for Professionals and Patients

Module 17. AI-assisted Dental Diagnostics and Treatment Planning

17.1. AI in Oral Disease Diagnosis
17.1.1. Use of Machine Learning Algorithms to Identify Oral Diseases
17.1.2. Integration of AI in Diagnostic Equipment for Real-Time Analysis
17.1.3. AI-assisted Diagnostic Systems to Improve Accuracy
17.1.4. Analysis of Symptoms and Clinical Signals through AI for Rapid Diagnostics
17.2. Dental Image Analysis with AI
17.2.1. Development of Software for the Automatic Interpretation of Dental Radiographs
17.2.2. AI in the Detection of Abnormalities in Oral MRI Images
17.2.3. Improvement in the Quality of Dental Imaging through AI Technologies
17.2.4. Deep Learning Algorithms for Classifying Dental Conditions in Imaging
17.3. AI in Caries and Dental Pathology Detection
17.3.1. Pattern Recognition Systems for Identifying Early Cavities
17.3.2. AI for Risk Assessment of Dental Pathologies
17.3.3. Computer Vision Technologies in the Detection of Periodontal Diseases
17.3.4. AI Tools for Caries Monitoring and Progression
17.4. 3D Modeling and Treatment Planning with AI
17.4.1. Using AI to Create Accurate 3D Models of the Oral Cavity
17.4.2. AI Systems in the Planning of Complex Dental Surgeries
17.4.3. Simulation Tools for Predicting Treatment Outcomes
17.4.4. AI in the Customization of Prosthetics and Dental Appliances
17.5. Optimization of Orthodontic Treatments using AI
17.5.1. AI in the Planning and Follow-up of Orthodontic Treatments
17.5.2. Algorithms for the Prediction of Tooth Movements and Orthodontic Adjustments
17.5.3. AI Analysis to Reduce Orthodontic Treatment Time
17.5.4. Real-time Remote Monitoring and Treatment Adjustment Systems
17.6. Risk Prediction in Dental Treatments
17.6.1. AI Tools for Risk Assessment in Dental Procedures
17.6.2. Decision Support Systems for Identifying Potential Complications
17.6.3. Predictive Models for Anticipating Treatment Reactions
17.6.4. Analysis of Clinical Histories using AI to Personalize Treatments
17.7. Personalization of Treatment Plans with AI
17.7.1. AI in the Adaptation of Dental Treatments to Individual Needs
17.7.2. AI-based Treatment Recommender Systems
17.7.3. Analysis of Oral Health Data for Personalized Treatment Planning
17.7.4. AI Tools for Adjusting Treatments Based on Patient Response

17.8. Oral Health Monitoring with Intelligent Technologies
- 17.8.1. Smart Devices for Oral Hygiene Monitoring
- 17.8.2. AI-enabled Mobile Applications for Dental Health Monitoring
- 17.8.3. Wearables with Sensors to Detect Changes in Oral Health
- 17.8.4. AI-based Early Warning Systems to Prevent Oral Diseases

17.9. AI in Oral Disease Prevention
- 17.9.1. AI Algorithms to Identify Risk Factors for Oral Diseases
- 17.9.2. Oral Health Education and Awareness Systems with AI
- 17.9.3. Predictive Tools for the Early Prevention of Dental Problems
- 17.9.4. AI in the Promotion of Healthy Habits for Oral Prevention

17.10. Case Studies: Diagnostic and Planning Successes with AI
- 17.10.1. Analysis of Real Cases where AI Improved Dental Diagnosis
- 17.10.2. Successful Case Studies on the Implementation of AI for Treatment Planning
- 17.10.3. Treatment Comparisons with and without the Use of AI
- 17.10.4. Documentation of Improvements in Clinical Efficiency and Effectiveness with AI

Module 18. Innovation with AI in Dentistry

18.1. 3D Printing and Digital Fabrication in Dentistry
- 18.1.1. Use of 3D Printing for the Creation of Customized Dental Prostheses
- 18.1.2. Fabrication of Orthodontic Splints and Aligners using 3D Technology
- 18.1.3. Development of Dental Implants using 3D Printing
- 18.1.4. Application of Digital Fabrication Techniques in Dental Restoration

18.2. Robotics in Dental Procedures
- 18.2.1. Implementation of Robotic Arms for Precision Dental Surgeries
- 18.2.2. Use of Robots in Endodontic and Periodontic Procedures
- 18.2.3. Development of Robotic Systems for Dental Operations Assistance
- 18.2.4. Integration of Robotics in the Practical Teaching of Dentistry

18.3. Development of AI-assisted Dental Materials
- 18.3.1. Use of AI to Innovate in Dental Restorative Materials
- 18.3.2. Predictive Analytics for Durability and Efficiency of New Dental Materials
- 18.3.3. AI in the Optimization of Properties of Materials such as Resins and Ceramics
- 18.3.4. AI Systems to Customize Materials according to Patient's Needs

18.4. AI-enabled Dental Practice Management
- 18.4.1. AI Systems for Efficient Appointment and Scheduling Management
- 18.4.2. Data Analysis to Improve Quality of Dental Services
- 18.4.3. AI Tools for Inventory Management in Dental Clinics
- 18.4.4. Use of AI in the Evaluation and Continuous Improvement of Dental Practice

18.5. Teleodontology and Virtual Consultations
- 18.5.1. Tele-dentistry Platforms for Remote Consultations
- 18.5.2. Use of Videoconferencing Technologies for Remote Diagnosis
- 18.5.3. AI Systems for Online Preliminary Assessment of Dental Conditions
- 18.5.4. Tools for Secure Communication between Patients and Dentists

18.6. Automation of Administrative Tasks in Dental Clinics
- 18.6.1. Implementation of AI Systems for Billing and Accounting Automation
- 18.6.2. Use of AI Software in Patient Record Management
- 18.6.3. AI Tools for Optimization of Administrative Workflows
- 18.6.4. Automatic Scheduling and Reminder Systems for Dental Appointments

18.7. Sentiment Analysis of Patient Opinions
- 18.7.1. Use of AI to Assess Patient Satisfaction through Online Feedback
- 18.7.2. Natural Language Processing Tools for Analyzing Patient *Feedback*
- 18.7.3. AI Systems to Identify Areas for Improvement in Dental Services
- 18.7.4. Analysis of Patient Trends and Perceptions using AI

18.8. AI in Marketing and Patient Relationship Management
- 18.8.1. Implementation of AI Systems to Personalize Dental Marketing Strategies
- 18.8.2. AI Tools for Customer Behavioral Analysis
- 18.8.3. Use of AI in the Management of Marketing Campaigns and Promotions
- 18.8.4. AI-based Patient Recommendation and Loyalty Systems

18.9. Safety and Maintenance of AI Dental Equipment
- 18.9.1. AI Systems for Monitoring and Predictive Maintenance of Dental Equipment
- 18.9.2. Use of AI in Ensuring Compliance with Safety Regulations
- 18.9.3. Automated Diagnostic Tools for Equipment Failure Detection
- 18.9.4. Implementation of AI-assisted Safety Protocols in Dental Practices

18.10. Integration of AI in Dental Education and Training
- 18.10.1. Use of AI in Simulators for Hands-on Training in Dentistry
- 18.10.2. AI Tools for the Personalization of Learning in Dentistry

18.10.3. Systems for Evaluation and Monitoring of Educational Progress using AI
18.10.4. Integration of AI Technologies in the Development of Curricula and Didactic Materials

Module 19. Advanced Analytics and Data Processing in Dentistry

19.1. *Big Data* in Dentistry: Concepts and Applications
19.1.1. The Explosion of Data in Dentistry
19.1.2. Concept of *Big Data*
19.1.3. Applications of *Big Data* in Dentistry
19.2. Data Mining in Dental Records
19.2.1. Main Methodologies for Data Mining
19.2.2. Integration of Data from Dental Records
19.2.3. Detection of Patterns and Anomalies in Dental Records
19.3. Advanced Predictive Analytics Techniques in Oral Health
19.3.1. Classification Techniques for Oral Health Analysis
19.3.2. Regression Techniques for Oral Health Analytics
19.3.3. *Deep Learning* for Oral Health Analysis
19.4. AI Models for Dental Epidemiology
19.4.1. Classification Techniques for Dental Epidemiology
19.4.2. Regression Techniques for Dental Epidemiology
19.4.3. Unsupervised Techniques for Dental Epidemiology
19.5. AI for Clinical and Radiographic Data Management
19.5.1. Integration of Clinical Data for Effective Management with AI Tools
19.5.2. Transformation of Radiographic Diagnosis using Advanced AI Systems
19.5.3. Integrated Management of Clinical and Radiographic Data
19.6. Machine Learning Algorithms in Dental Research
19.6.1. Classification Techniques in Dental Research
19.6.2. Regression Techniques in Dental Research
19.6.3. Unsupervised Techniques in Dental Research
19.7. Social Network Analysis in Oral Health Communities
19.7.1. Introduction to Social Network Analysis
19.7.2. Analysis of Opinions and Sentiment in Social Networks in Oral Health Communities
19.7.3. Analysis of Social Network Trends in Oral Health Communities
19.8. AI in Monitoring Oral Health Trends and Patterns
19.8.1. Early Detection of Epidemiologic Trends with AI
19.8.2. Continuous Monitoring of Oral Hygiene Patterns with AI Systems
19.8.3. Prediction of Changes in Oral Health with AI Models
19.9. AI Tools for Cost Analysis in Dentistry
19.9.1. Optimization of Resources and Costs with AI Tools
19.9.2. Efficiency and Cost-Effectiveness Analysis in Dental Practices with AI
19.9.3. Cost Reduction Strategies Based on AI-analyzed Data
19.10. Innovations in AI for Dental Clinical Research
19.10.1. Implementation of Emerging Technologies in Dental Clinical Research
19.10.2. Improving the Validation of Dental Clinical Research Results with AI
19.10.3. Multidisciplinary Collaboration in AI-powered Detailed Clinical Research

Module 20. Ethics, Regulation and the Future of AI in Dentistry

20.1. Ethical Challenges in the Use of AI in Dentistry
20.1.1. Ethics in AI-assisted Clinical Decision Making
20.1.2. Patient Privacy in Intelligent Dentistry Environments
20.1.3. Professional Accountability and Transparency in AI Systems
20.2. Ethical Considerations in the Collection and Use of Dental Data
20.2.1. Informed Consent and Ethical Data Management in Dentistry
20.2.2. Security and Confidentiality in the Handling of Sensitive Data
20.2.3. Ethics in Research with Large Datasets in Dentistry
20.3. Fairness and Bias in AI Algorithms in Dentistry
20.3.1. Addressing Bias in Algorithms to Ensure Fairness
20.3.2. Ethics in the Implementation of Predictive Algorithms in Oral Health
20.3.3. Ongoing Monitoring to Mitigate Bias and Promote Equity
20.4. Regulations and Standards in Dental AI
20.4.1. Regulatory Compliance in the Development and Use of AI Technologies
20.4.2. Adaptation to Legal Changes in the Deployment of IA Systems
20.4.3. Collaboration with Regulatory Authorities to Ensure Compliance

20.5. AI and Professional Responsibility in Dentistry
- 20.5.1. Development of Ethical Standards for Professionals using AI
- 20.5.2. Professional Responsibility in the Interpretation of AI Results
- 20.5.3. Continuing Education in Ethics for Oral Health Professionals

20.6. Social Impact of AI in Dental Care
- 20.6.1. Social Impact Assessment for Responsible Introduction of AI
- 20.6.2. Effective Communication about AI Technologies with Patients
- 20.6.3. Community Participation in the Development of Dental Technologies

20.7. AI and Access to Dental Care
- 20.7.1. Improving Access to Dental Services through AI Technologies
- 20.7.2. Addressing Accessibility Challenges with AI Solutions
- 20.7.3. Equity in the Distribution of AI-assisted Dental Services

20.8. AI and Sustainability in Dental Practices
- 20.8.1. Energy Efficiency and Waste Reduction with AI Implementation
- 20.8.2. Sustainable Practice Strategies Enhanced by AI Technologies
- 20.8.3. Environmental Impact Assessment in the Integration of AI Systems

20.9. AI Policy Development for the Dental Sector
- 20.9.1. Collaboration with Institutions for the Development of Ethical Policies
- 20.9.2. Creation of Best Practice Guidelines on the Use of AI
- 20.9.3. Active Participation in the Formulation of AI-related Government Policies

20.10. Ethical Risk and Benefit Assessment of AI in Dentistry
- 20.10.1. Ethical Risk Analysis in the Implementation of AI Technologies
- 20.10.2. Ongoing Assessment of Ethical Impact on Dental Care
- 20.10.3. Long-term Benefits and Risk Mitigation in the Deployment of AI Systems

You will acquire the most up-to-date knowledge of the landscape of Artificial Intelligence applied to Dentistry"

06

Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

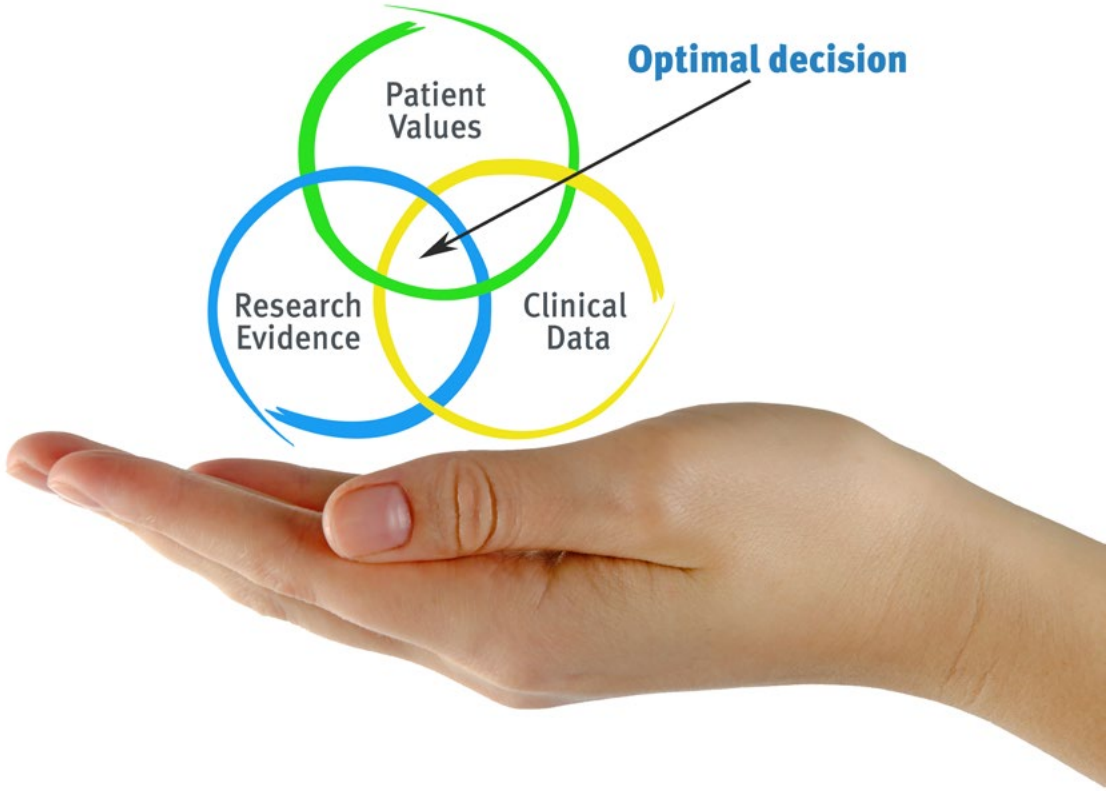
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

At TECH we use the Case Method

In a given situation, what should a professional do? Throughout the program, students will face multiple simulated clinical cases, based on real patients, in which they will have to do research, establish hypotheses, and ultimately resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Specialists learn better, faster, and more sustainably over time.

With TECH you will experience a way of learning that is shaking the foundations of traditional universities around the world.



According to Dr. Gérvas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, trying to recreate the real conditions in the dentist's professional practice.

Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method"

The effectiveness of the method is justified by four fundamental achievements:

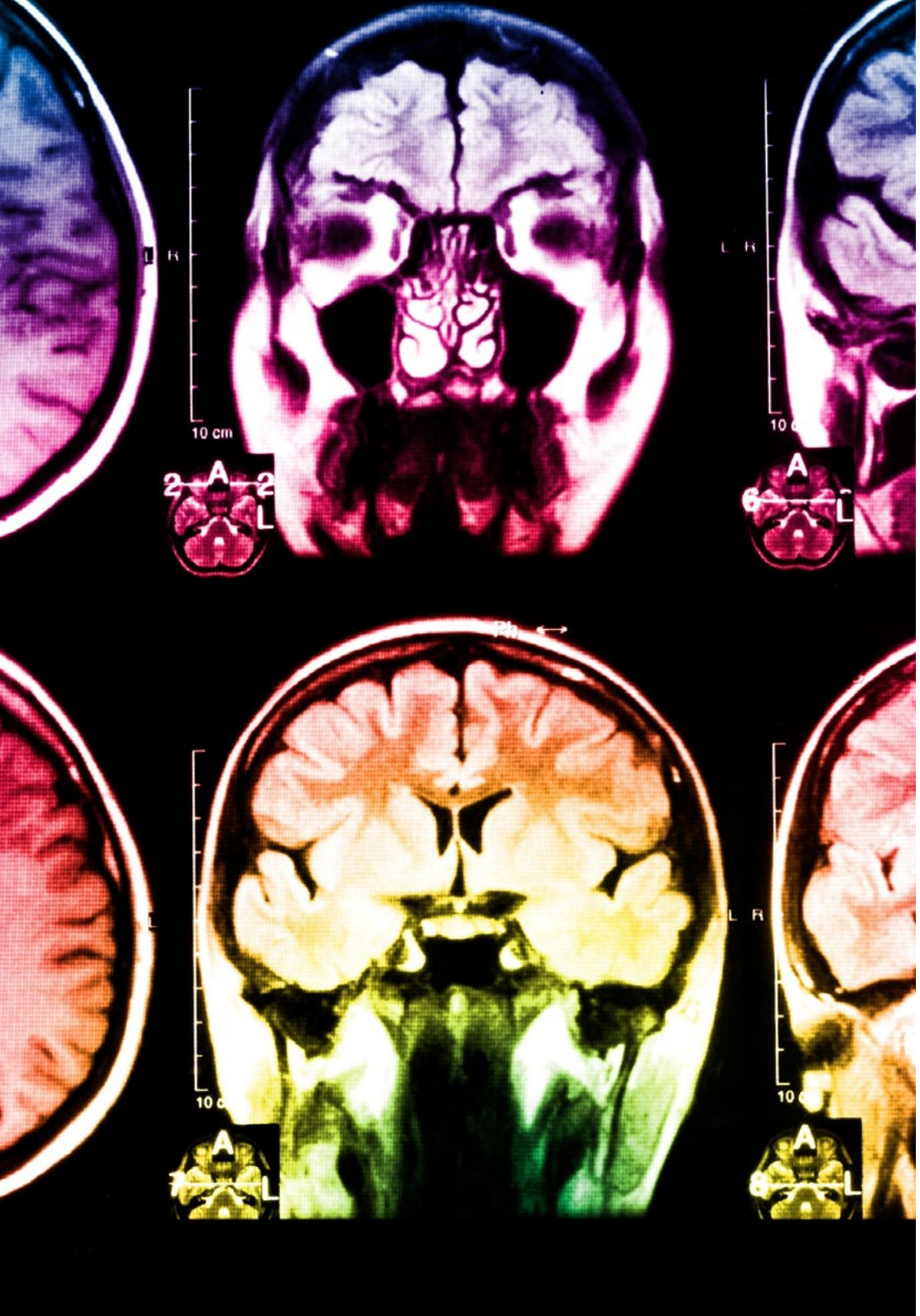
1. Dentists who follow this method not only grasp concepts, but also develop their mental capacity by means of exercises to evaluate real situations and apply their knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.

The student will learn through real cases and by solving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.



At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology we have trained more than 115,000 dentists with unprecedented success, in all specialties regardless of the workload. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.

In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

The overall score obtained by TECH's learning system is 8.01, according to the highest international standards.

This program offers the best educational material, prepared with professionals in mind:

Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

Educational Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances, and to the forefront of medical techniques. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch the videos as many times as you like.

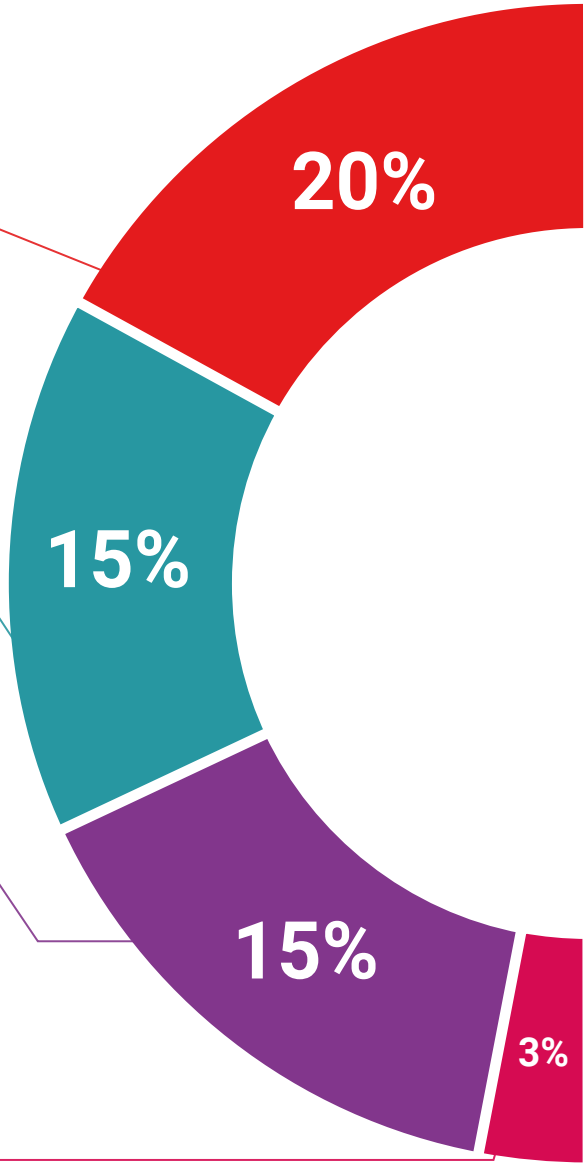
Interactive Summaries

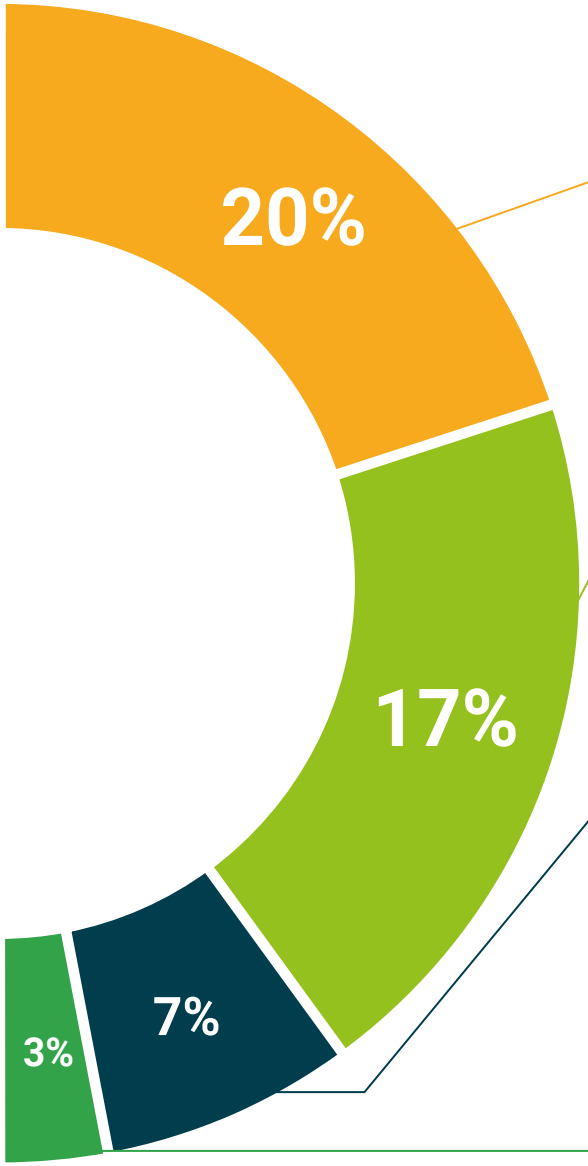
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.

Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.

07

Certificate

The Professional Master's Degree in Artificial Intelligence in Dentistry guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree diploma issued by TECH Technological University.

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This **Professional Master's Degree in Artificial Intelligence in Dentistry** contains the most complete and up-to-date scientific on the market.

After the student has passed the assessments, they will receive their corresponding **Professional Master's Degree** issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Professional Master's Degree,and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees. .

Title: **Professional Master's Degree in Artificial Intelligence in Dentistry**

Official Number of Hours: **2,250 h.**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Artificial Intelligence in Dentistry

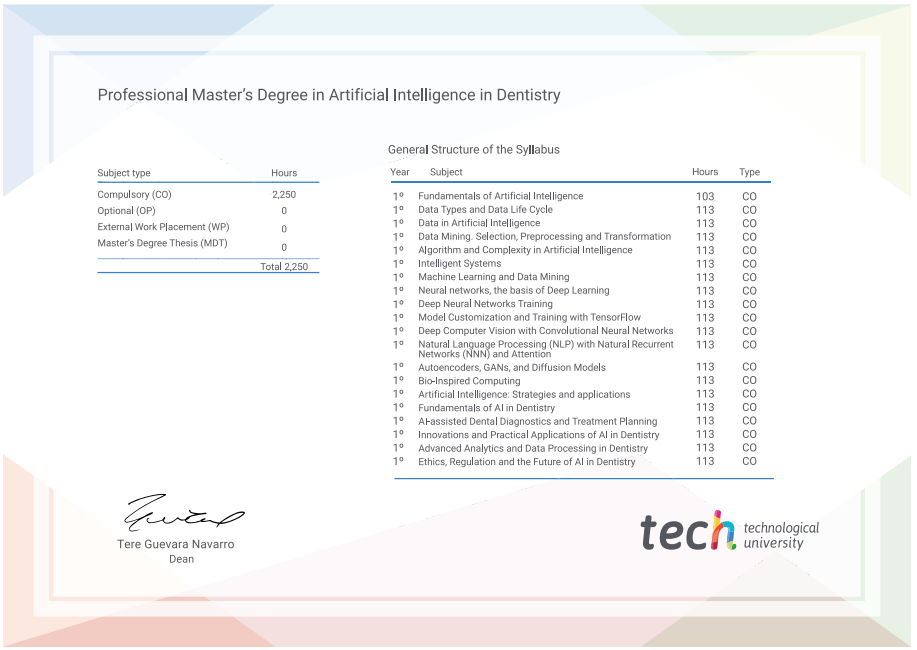
This is a qualification awarded by this University, equivalent to 2,250 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Artificial Intelligence in Dentistry

Subject type	Hours
Compulsory (CO)	2,250
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 2,250

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Fundamentals of Artificial Intelligence	103	CO
1º	Data Types and Data Life Cycle	113	CO
1º	Data in Artificial Intelligence	113	CO
1º	Data Mining. Selection, Preprocessing and Transformation	113	CO
1º	Algorithm and Complexity in Artificial Intelligence	113	CO
1º	Intelligent Systems	113	CO
1º	Machine Learning and Data Mining	113	CO
1º	Neural networks, the basis of Deep Learning	113	CO
1º	Deep Neural Networks Training	113	CO
1º	Model Customization and Training with TensorFlow	113	CO
1º	Deep Computer Vision with Convolutional Neural Networks	113	CO
1º	Natural Language Processing (NLP) with Natural Recurrent Networks (NNN) and Attention	113	CO
1º	Autoencoders, GANs, and Diffusion Models	113	CO
1º	Bio-Inspired Computing	113	CO
1º	Artificial Intelligence: Strategies and applications	113	CO
1º	Fundamentals of AI in Dentistry	113	CO
1º	AI-assisted Dental Diagnostics and Treatment Planning	113	CO
1º	Innovations and Practical Applications of AI in Dentistry	113	CO
1º	Advanced Analytics and Data Processing in Dentistry	113	CO
1º	Ethics, Regulation and the Future of AI in Dentistry	113	CO

Tere Guevara Navarro
Dean

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*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

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Professional Master's Degree

Artificial Intelligence in Dentistry

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

Artificial Intelligence in Dentistry

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