ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

GUJARATUNIVERSITY

PROSPECTUS PACKAGE 2020





ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

"Al is probably the most Important thing humanity has ever worked on"

> Sundar Pichai CEO Google



GUJARAT UNIVERSITY

INTEGRATED M.Sc.

M.Sc. in AIML Artificial Intelligence & Machine Learning



Five Years Integrated Program B.Sc. (3 Years) + M.Sc. (2 Years)

VICE CHANCELLOR

Prof. (Dr.) Himanshu Pandya



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Gujarat University is the oldest and the largest university of the state of Gujarat, established in 1949 by Sardar Vallabhbhai Patel with the vision of Mahatma Gandhi. The University today is the top university in the state of Gujarat, offering courses across a plethora of domains, from rock-solid fundamental courses across sciences, humanities, business and various other streams to courses aligned with the needs of the modern age, involving defence, aviation, AI /ML, etc. I'm glad that you are considering the course at GU, which is one such course we introduced with an emphasis on offering new-age courses to young Indians to employ them with the right skills and making them industry-ready. This five-year integrated course is one of the most promising courses that we today offer, blending in a mix of fundamental knowledge across various disciplines, with necessary practical experience. An admission at GU means getting an access pass to a haven of knowledge, creativity, innovation, and youthful experiences. GU is the same University that has given the country stalwarts such as the father of Indian space program Vikram Sarabhai, Prime Minister Narendra Modi, business tycoon Gautam Adani and noted social worker Elaben Bhatt, alongside dozens of other national figures. Among many other things, our campus is now home to one of the best startup support systems in the country, India's first research park, and an upcoming Sports City that would allow you and the entire university family to have access to Olympics-standard infrastructure for over 16 sports and games, all of which have been provisioned for the benefit and success of students such as you. I welcome you to Gujarat University to experience a new standard of education, knowledge and practical application of your ideas, all within the vicinity of what could be your campus.



PROVICE CHANCELLOR

Dr. Jagdish Bhavsar





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I am pleased that you are interested in the course at Gujarat University, which has been recently recognized as Gujarat's #1 university by the state government. This course has been designed keeping in mind the constantly changing business, economic and industrial environments around the world. At Gujarat University, we have been bringing in several reforms since the last several years across our academic, co-curricular and extra-curricular platforms, and this course is part of the university's evolution and strategy to align itself with the needs of today's time and to ensure our students are given the right knowledge, skills and tools to become successful professionals in their domain areas. Our courses are delivered in new facilities within our completely redone campus, which now boasts state-of-the-art infrastructure such as smart classrooms as a bare minimum standard, excellent geographical location and a lush-green campus that allows GU to be called the 'Lungs of Ahmedabad'. A variety of facilities are being regularly provisioned in the campus for the benefits of students, and our attitude of keeping student-friendliness at the heart of everything that we do has allowed GU to be recognized as a top university. I am certain that joining this five-year integrated course would be an exuberant and exciting journey for you, which would define how your career ahead shapes up. I welcome you to Gujarat University!



MESSAGE FROM THE COURSE COORDINATOR



Dr. Ravi Gor Dept. of Mathematics, GU



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The combination of Artificial Intelligence (AI) and Machine learning (ML) is now the most important emerging technology across major areas of research and industry, primarily because of the recent successes of deep learning. All is being widely recognized as a power that will fuel the future global digital economy, and ML is a form of AI that enables a system to learn from data rather than through explicit programming. Machine learning has become one of the most important topics within development organizations that are looking for innovative ways to leverage data assets to help the business gain a new level of understanding. Combined together, AI & ML is a multidisciplinary field that requires a range of skills in statistics, mathematics, predictive modelling, business analysis and computer programming. At Gujarat University, the Five Year Integrated M.Sc. in Artificial Intelligence and Machine Learning Program leading to a Masters Degree in Artificial Intelligence and Machine Learning has been carefully designed to nurture young, enthusiastic and disciplined minds to learn and hone the necessary skills to become a highly skilled and effective AI & ML specialist. The program draws in scholarly content in the areas of mathematics, statistics, computers, computer programming and coding, machine learning, professional skills, communications. Emphasis will be placed on integration and synthesis of concepts and their application to solving problems. The program also stresses on the importance of skill-based education and the value of project related work in order to effectively harness the potential of AI & ML in a sustainable manner and to make our young minds 'AI&ML ready'. We welcome you to Gujarat University!



M.Sc. INTEGRATED (AIML)

"Intelligence is the ability to adapt to change"

Stephen Hawking





M.Sc. INTEGRATED (AIML)

The Key to the Future lies in <u>Thinking* beyond</u> what prevails,

"<u>Evolution</u>" in some areas of life as a result..



TELECOMMUNICATIONS



PAST

- Wired Connections
- Bulky Handsets
- Trunk Calls booking
- STD / ISD dialing



PRESENT

- Mobile / Cell phones
- Key pad phones
- Smart phones
- Black berry / I-Phone



- Foldable phones
- Projectors phones
- Transparent phones
- Solar powered phones

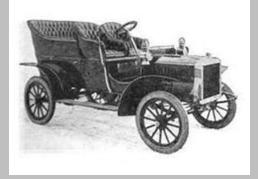




TRANSPORTATION : PERSONAL

PAST

- Steam engine cars
- Heavy metal cars
- Low power / speed
- Manual handle start





- Electric Start with AC
- Compact yet spacious
- Diesel/Petrol/Gas
- Electronic controls



- Flying cars : Air + Road
- Vertical Take Off/Landing
- Solar / Electric powered
- Speeds > 450 kmph





TRANSPORTATION: PUBLIC

PAST

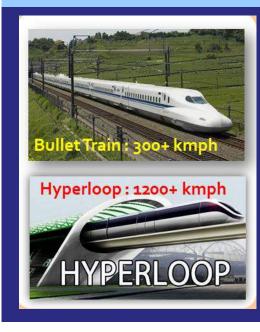
- Steam engine cars
- Heavy metal cars
- Low power / speed
- Manual handle start



PRESENT

- Diesel & electric trains
- Now all broad gauge
- Higher speeds : 150 kmph
- More comfortable







EDUCATION METHODOLOGY

PAST

- Black/green boards
- White & color chalks
- Fixed syllabus
- Mostly non-interactive



PRESENT

- LCD projector
- Smart class
- Audio Visuals
- Upgrading syllabus



- Fully touch screen
- Online / LMS / Internet
- AR-VR based 3D
- Dynamic syllabus





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CAREER TRANSITION IN DIFFERENT ERAS

AGRICULTURE

- Agriculture economy
- Barter transactions
- Inherited profession
- ≻ Farmer
- Barber
- Black Smith
- Gold Smith
- > Cloth Weaver & Tailor
- Grocery Merchant
- Wood Cutter & Carpenter
- Doctors (Vaids / Hakims)
- Horse Carriage Drivers



- Industrial economy
- Currency transactions
- Salaried jobs
- > Engineers
- Teachers
- Specialized Doctors / Surgeons
- > Public Administrators
- > Managers
- > Pharmacists
- > Chartered Accountants
- Company Secretary
- Stock Traders etc...



- Digital economy
- Currency + online
- Start of automations
- > Computer Hardware Engineers
- Computer Software Engineers
- Web / Graphics Animators
- Biotechnology specialists
- Genetic Technology specialists
- Cyber Security Specialists
- Sound Engineers
- Entertainment Managers
- ≻ IT / MIS Managers





UPCOMING CAREERS IN THE NEW AGE





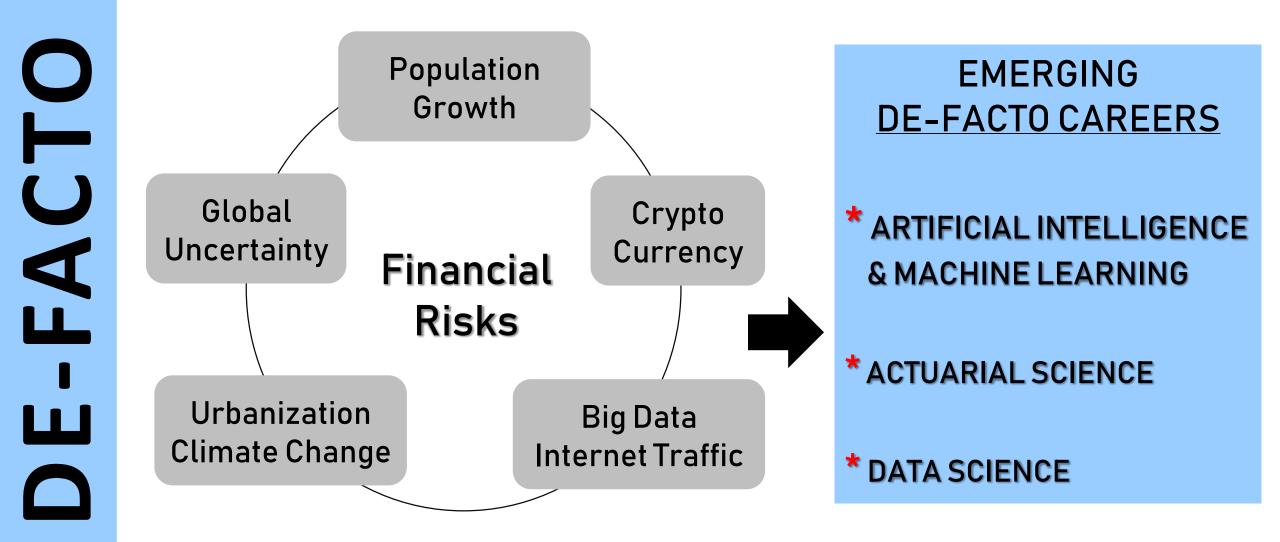
UPCOMING "REVOLUTION"



- Industry 4.0 & Internet Of Things (IoT)
- Big Data Analytics
- Robotics, Drones, Blockchain
- Virtual Reality & Augmented Reality
- RFID chip based human tagging
- Genetic Engineering / Digital Genome
- Neuromorphic technology
- Nano robots based micro surgery
- Quantum Computing
- Collaborative Telepresence
- E-Commerce & M-Commerce
- 3D Printing & Additive Manufacturing
- Recycling technology for environment
- Solar & alternate energy management
- Artificial Intelligence & Machine Learning
- 4K based Global Positioning Systems
- Cloud and virtual storage systems



5 GLOBAL FACTORS : NEW AGE CAREERS*



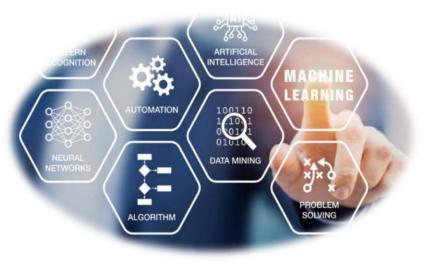


ARTIFICIAL INTELLIGENCE & MACHINE LEARNING



Artificial Intelligence (AI) is a wide ranging branch of computer science concerned with Building smart machines capable of performing tasks that typically require human intelligence. It is the endeavor to replicate or simulate human intelligence in machines.

Machine Learning (ML) is an application of artificial intelligence that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine Learning focuses on the development of computer programs that can access data and use it to learn for themselves





THREE LAYERS OF AIML

Artificial Intelligence

Computer systems that perform tasks that would usually require human intelligence

Machine Learning

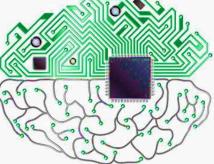
Statistical techniques that learn from series of inputs and outputs





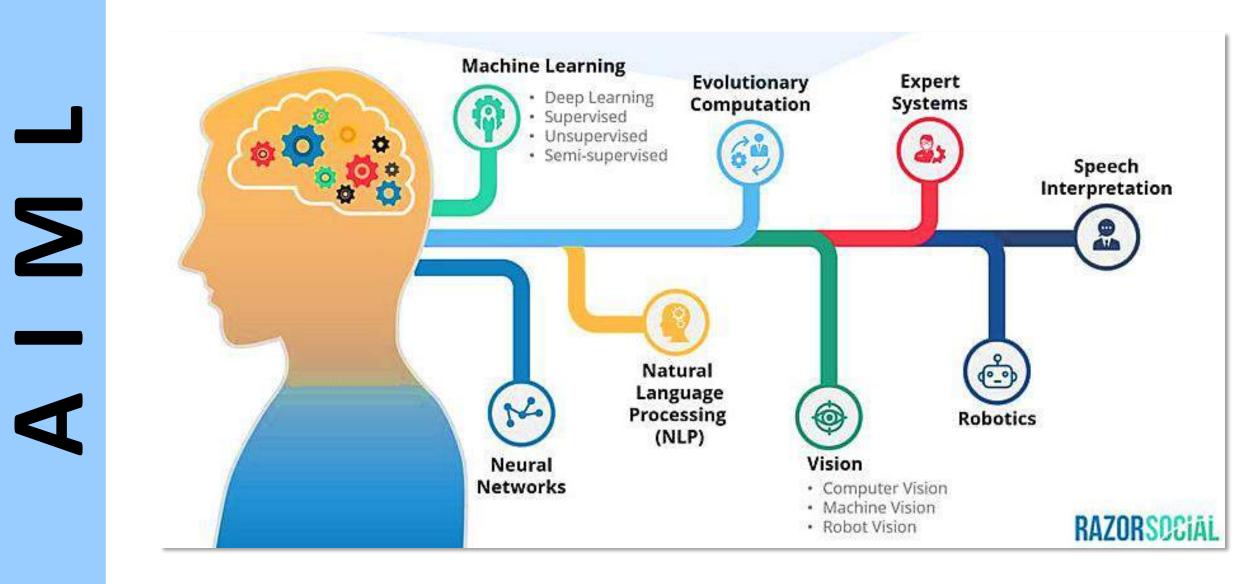
Deep Learning

Algorithms that enable self learning to mimic human intelligence





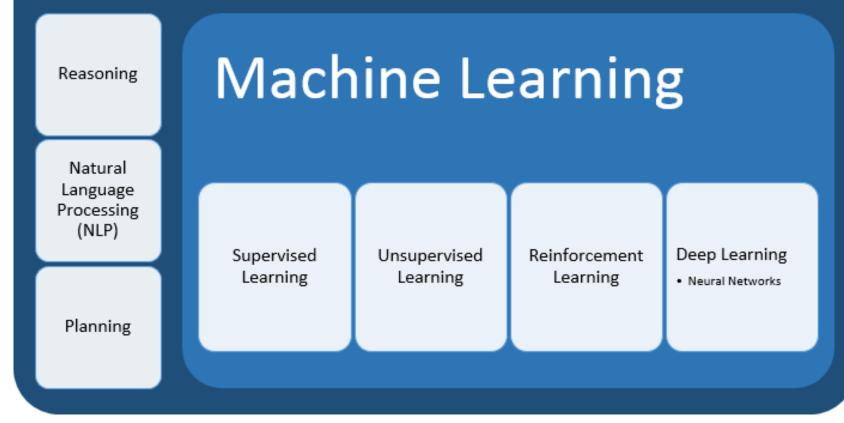
THE ELEMENTS OF AIML





MLAS SUBSET OF AI

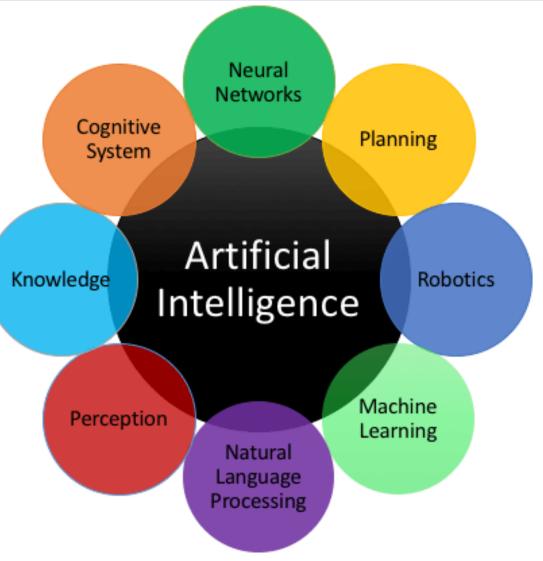
Artificial Intelligence



Source =https://www.ibm.com/analytics/machine-learning



MULTIDIMENSIONAL AI



Source = https://in.pinterest.com/pin/552676185512543564/



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ARTIFICIAL INTELLIGENCE VS HUMAN INTELLIGENCE

ARTIFICIAL INTELLIGENCE	HUMAN INTELLIGENCE
Created by Human intelligence	Created by Nature
Processes information faster	Processes information slower
Highly objective	May be subjective
More accurate	May be less accurate
Uses only 2 Watts of energy	Uses 25 Watts of energy
Cannot adopt to changes well	Can readily adapt to change
Cannot multitask well enough	Can easily multi task
Below average social skills	Excellent social skills
Still working towards self awareness	Has self awareness
Optimization	Innovation

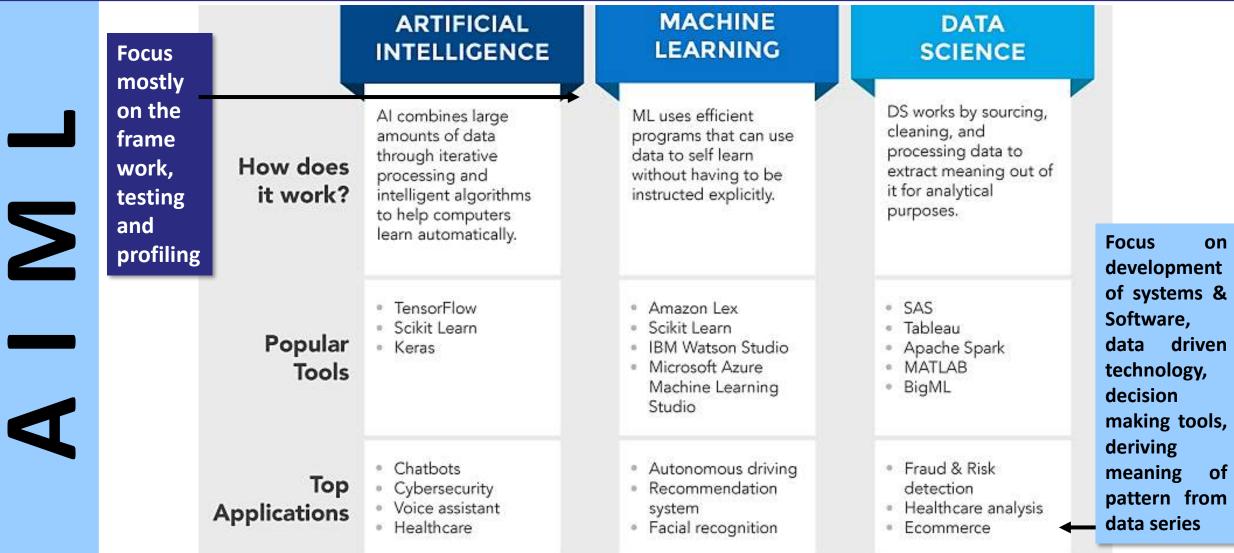


ARTIFICIAL INTELLIGENCE VS MACHINE LEARNING

ARTIFICIAL INTELLIGENCE	MACHINELEARNING
A computer program that does smart work	A concept machine that takes data & learns from it
Goal is to simulate natural intelligence to solve complex problem	Goal is to learn from data & maximize the performance of machine on the specified task
Al is decision oriented, hence convergent	ML is possibility oriented, hence divergent
It leads to develop a system to mimic human to respond behave in a circumstances.	It involves in creating self-learning algorithms.
AI will searches for optimal solution.	ML will search for solution whether optimal or not.
Al leads to intelligence or wisdom.	ML leads to knowledge.



AIML VS DATA SCIENCE



Source = https://www.mygreatlearning.com/blog/difference-data-science-machine-learning-ai/



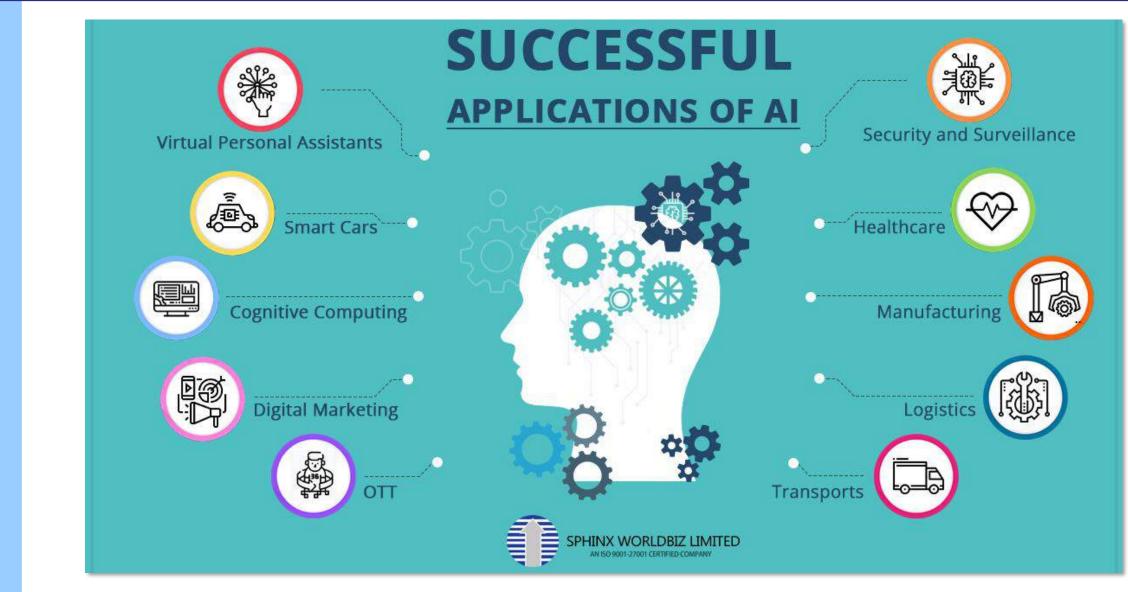
TOP 10 AIML APPLICATIONS <u>CURRENTLY IN USE</u>





APPLICATION

SUCCESSFUL APPLICATIONS OF AI





SOME INDUSTRY APPLICATIONS ILLUSTRATIONS

Banking & Insurance

- Personalized product & offers marketing campaigns
- Fraud Analysis & investigation
- Text Analytics for regulatory compliance
- Tailored Customer Insights for insurance product recommendations

Healthcare & Life Sciences

- Evidence based Diagnosis and Treatment
- Detecting eligibility fraud in Claims management
- Personalized Health Services

Government

- Crime prediction and prevention
- Environmental Monitoring and Sustainability analytics
- Industrial Health Safety and Emergency Responses

Pharmaceuticals

- Batch Yield Prediction during drug manufacturing
- Signal analysis for predicting potential adverse events
- Rebate optimization for third party administrators

Manufacturing, Energy

- Optimize energy consumption in manufacturing plants
- Balance supply and demand for energy grids
- Predict system faults and reduce disruptions from sensor data

Retail

- Price Promotions and Markdown Optimization.
- Up-sell and Cross-sell recommendations engine
- Dynamic pricing across multiple Channels



AI IN FINANCIAL SERVICES

The Impact of AI/ML

AI/ML use cases are gaining traction in Financial Services

Compliance, Surveillance and Fraud Detection Document Processing Pricing and Product Recommendation

Trading

Customer Experience

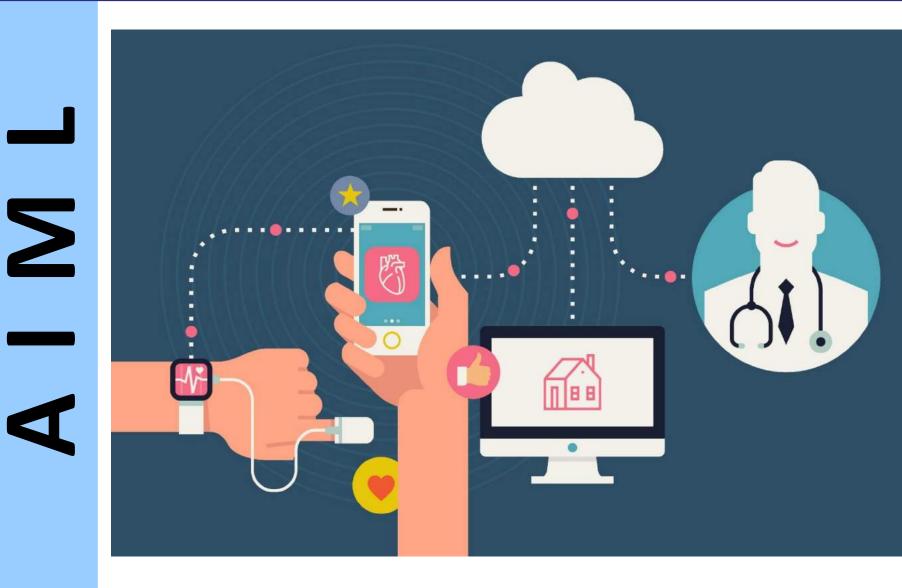




Source = AWS Financial Services



AI IN HEALTHCARE



Inputs will be taken via the Interfaces fed to the mobile app from home or anywhere directly and then sent to the cloud.

Entire diagnosis will be done by AI

From cloud it reaches the doctor

Based on doctors inputs the AI system then prescribes the drugs

Source = Latentview.com



AI & CLINICAL TRIALS



ANALYZING HISTORICAL OPERATIONAL DATA



MEASURING DRUG



PREDICTING SITE PERFORMANCE

MONITORING TRIAL RISKS PREEMPTIVELY



CENTRALIZING TRIAL



ENABLING VOICE-ASSISTED TECHNOLOGIES

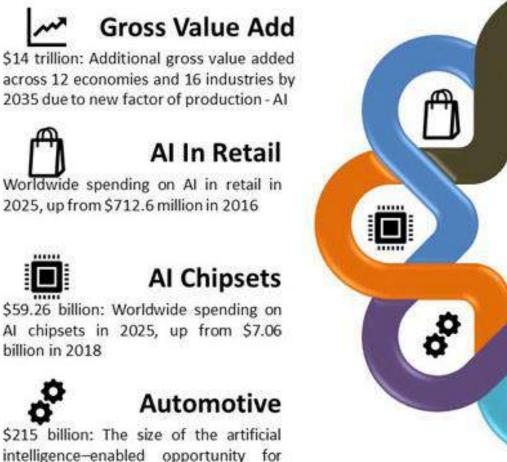
MONITORING DRUG

ENABLING SITE-LESS AND VIRTUAL TRIALS

Source :https://www.ert.com/blog/transforming-clinical-trials-through-the-power-of-ai/



THE WAY FORWARD



the automotive industry by 2025

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Source = https://Inctu.ac.in/csaiml/

New Skills



375 million: The number of workers around the world that may need to switch occupational categories and learn new skills because of AI

Spending on Al



\$52.2 billion: Worldwide spending on cognitive and artificial intelligence systems in 2021

AI Software



\$89.8 billion: Worldwide AI software revenues in 2025, up from \$3.2 billion in 2016

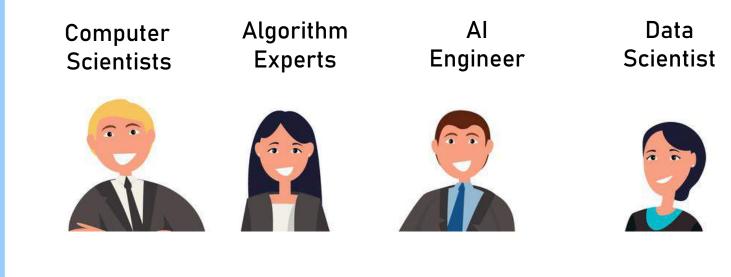
Robotics

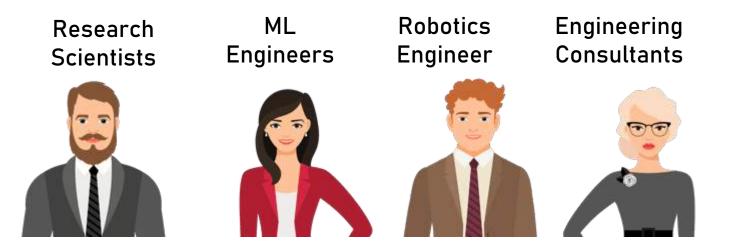


Robotics investments in October 2018 totalled at \$1.24 billion with a 23 verified investments



DIVERSE JOB PROFILES







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AIML

KEY RESPONSIBILITIES

- Perform statistical analysis
- Fine tuning test results
- Train and retrain systems
- Work on frameworks
- Undertaking machine learning experiments and test
- Designing machine learning programs
- Developing deep learning systems to various use cases based on the business needs
- Implementing suitable AI/ML algorithms





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AIML

SKILLS REQUIRED

• Ability to write code in Java and Python.

• Deep knowledge of applications of math and stat.



• Good understanding and strong knowledge in algorithm.

• Appreciation of data modelling, software architecture and data structures.

• Reasonable communication skills and willingness to work in teams.



TYPICAL PROFILES

- SIONALS S ш 0 Ľ Δ. AIML
- Image and speech recognition Machine learning excels at auto-tagging images, text-to-speech conversions and anything else that requires turning unstructured data into useful information.

• Customer insight — Association rule learning, the way ML software makes connections, drives the algorithms at the heart of e-commerce, telling consumers who buy product X that they might also like product Y.

 Risk management and fraud prevention — ML algorithms can analyze huge volumes of historical data to make financial predictions, from future investment performance to the risk of loan defaults. Regression testing also makes it easier to spot fraudulent transactions in real time.



REMUNERATION FOR AI ENGINEERS



AI ENGINEERS

An artificial intelligence programmer helps develop operating software that can be used for robots, artificial intelligence programs or other artificial intelligence applications. They may work closely with electrical engineers or robotics engineers and others in order to produce systems that utilize artificial intelligence.

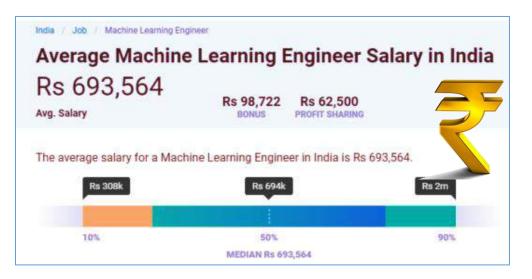
8,000 2018 Jobs ₹ 20,00,000* Median salary

Al engineering jobs can be found in the following cities (data - per quarter).



"years of experience affects the salary, which can be as high as Rs 30,00,000 per year.





https://tech.economictimes.indiatimes.com/news/people/these-are-the-top-5-jobs-of-2018/67043587



MAJOR RECRUITERS





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MATCHING "ATMANIRMBHAR BHARAT" VISION

Foundation for \$5 Trillion economy



With a major quantum thrust to the economy with focus on . . .

- Infrastructure
- Demography
- Demand & Supply
- Systems (Technology & Automation)

The NEED for AIML Experts will escalate high

AIML @ Gujarat University is aimed to fulfill its role to meet this Need.



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AIML @ GUJARAT UNIVERSITY

- AIML is a theory and development of computers systems to be able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, and neural network, decision making. ML makes it possible for machines to learn from experience, adjust to new inputs and perform human like tasks. The program will focus on AIML methods based in different fields, including neural networks, signal processing, control and data mining in order to present a unified treatment of machine learning problems and solutions using real time problem solving using AI & ML methods.
 - Classroom training here will help the sincere and motivated students to be industry ready.
 - Fees: Rs.37,600 per semester

Number of Seats : 60 Only

Duration : Integrated 5 Years (10 semesters) = B.Sc. (3 Years) + M.Sc. (2 Years). There is an option to exit after B.Sc. degree.

(The First and only one in India to offer 5 Years Integration)



ELIGIBILITY

<u>Eligibility</u>

Students with Min. 10 + 2 in formal education in...

- Science Group A : Physics + Chemistry + Mathematics
- Science Group B : Physics + Chemistry + Biology
- Science Group AB : Physics + Chemistry + Maths + Biology
- ✓ Commerce



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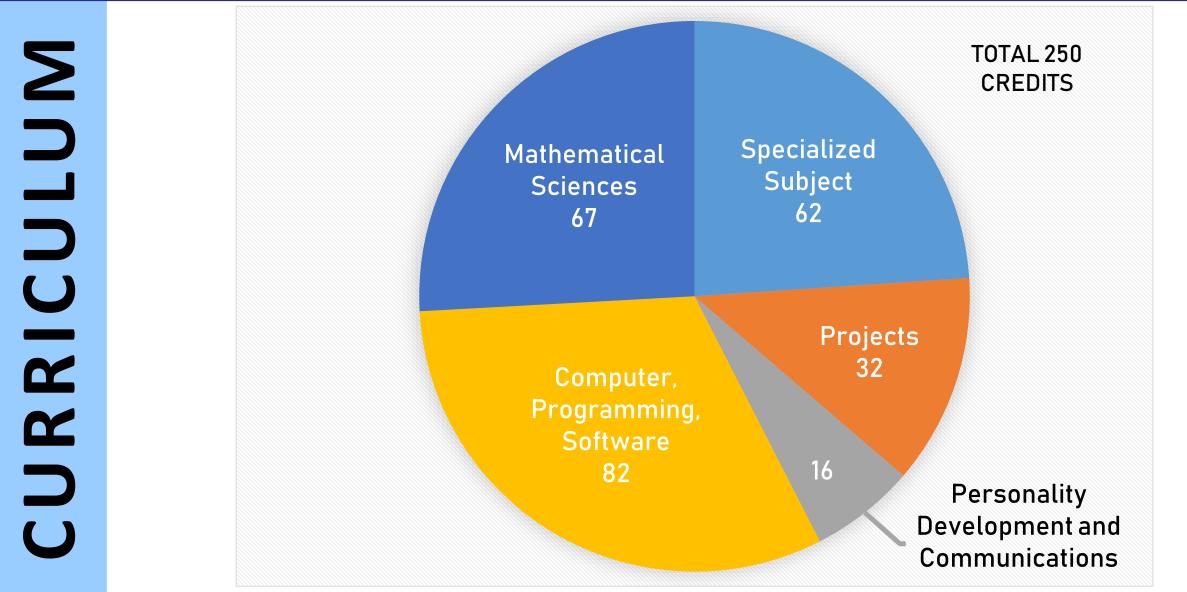
OURSE

REQUIREMENT TO COMPLETE M.Sc.

Students have to undergo a total of 150 credit courses and pass the necessary university examinations to earn a B.Sc. Degree and a total of 100 credit courses and examinations to earn a M.Sc. Degree. Total Credits for the M.Sc. [Integrated (B.Sc. + M.Sc.) = 150 + 100 = 250 credits]

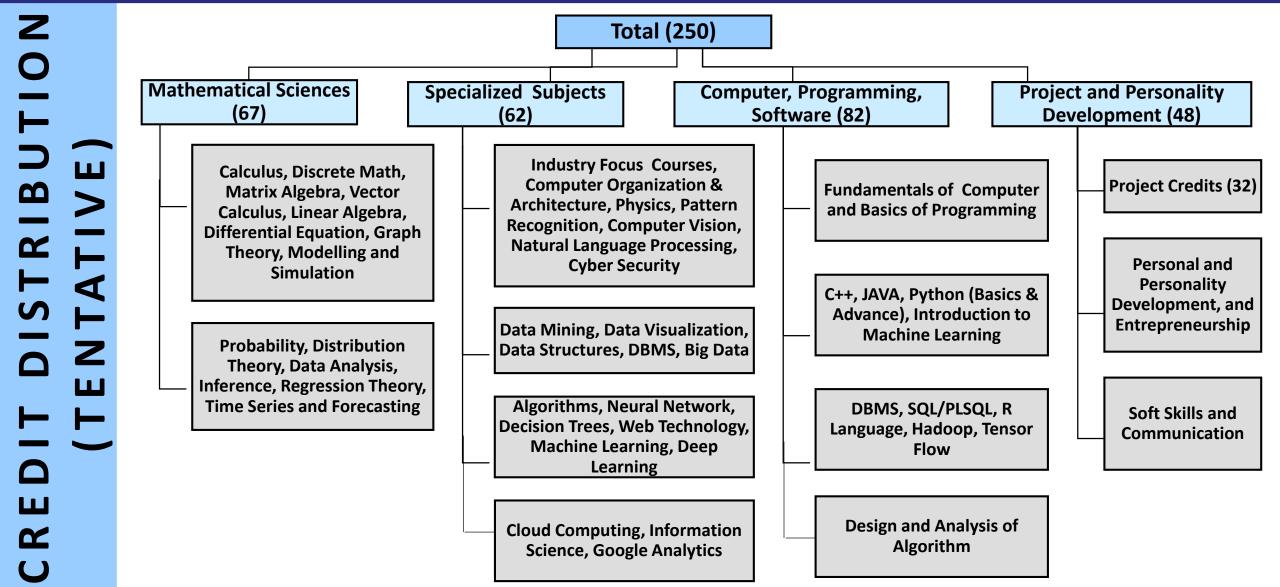


AIML @ GUJARAT UNIVERSITY





AIML @ GUJARAT UNIVERSITY





Mathematical Sciences (67)

- Calculus, Discrete Math, Matrix Algebra, Vector Calculus, Linear Algebra, Differential Equation, Graph Theory, Modelling and Simulation
- Probability, Distribution Theory, Data Analysis, Inference, Regression Theory, Time Series and Forecasting

Specialized Subjects (62)

- Industry Focus Courses, Computer Organization & Architecture, Physics, Pattern Recognition, Computer Vision, Natural Language Processing, Cyber Security
- Data Mining, Data Visualization, Data Structures, DBMS, Big Data
- Algorithms, Neural Network, Decision Trees, Web Technology, Machine Learning, Deep Learning
- Cloud Computing, Information Science, Google Analytics

Computer, Programming, Software (82)

- Fundamentals of Computer and Basics of Programming
- C++, JAVA, Python (Basics & Advance), Introduction to Machine Learning
- DBMS, SQL/PLSQL, R Language, Hadoop, Tensor Flow
- Design and Analysis of Algorithm

Project and Personality Development (48)

- Project Credits(32)
- Personal and Personality Development, and Entrepreneurship
- Soft skills and Communication
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AIML@ GUJARAT UNIVERSITY

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Yagna Bhatt



I am very grateful to join Gujarat University in the course of Artificial Intelligence and Machine Learning [AIML]. This is a remarkable course designed by our university with experienced faculties. The department of AIML is to produce students with a sound understanding of the fundamentals of the theory and practical. This is the exceptional and extraordinary course all over the Gujarat. Our faculties have developed this type of fantastic course and have shown their long vision for the growth and prospects of our country. Our professors are exceptionally good. The infrastructure of our department is also wonderful. All the students are granted with extraordinary books. facilities The library administration department is helpful to students in terms of solving gueries and problems

Esha Mishra



Department has a good infrastructure. Faculties are always there to clear doubts. Incase of any problems, the helpful administration is always there, doing the best for the students.

Apart from GU main library Department also has its own library. In this course they focus on not only theoretical aspect but also real-life application of different subjects.

Apart from finals and mid-terms we have regular practical exams, quizzes and assignments in each semester to ensure students study regularly.



Het Bhavsar



Really appreciate the dedication of faculty members who have supported me to understand points out of the syllabus and this course goes into both theoretical and practical approach from base fundamental level.

College has pretty new infrastructure with latest technology classrooms,

We regularly use our labs for practices and Library has latest edition books from top publishers so we don't need to purchase books from outside. For some subjects faculties provide notes and PPT to develop better understanding of students

Aneri Patel



My academic experience is new every day with lots of learning & curiosity to achieve more and moe. Our expert Faculties are an experienced interface in their respective fields exploring the technology needs in the present YUG. Great supportive Administration team is always ready to support and cater our daily needs of practical and providing all resources required. Fully furnished Library and Laboratories are the area of our research and development and new learning techniques, ICT Classrooms are best possible facility provided to understand the concepts effectively and our New Building seems to be a Department where I feel as my own learning hub where I can explore my modern technological capabilities. Artificial Intelligence is creating a technological revolution and I am proud to be a learning part of this course at my Gujarat University.



Eric Vadhvania



Artificial intelligence has been recognized as the future. In future it will be as a source of solutions to every other needs.

Like how the robotics has become a useful in every other industries, medical, infrastructure and IT sector. For that way, Gujarat University has introduced an Al&ML course; which has been very helpful to every student who has enrolled in it.

This course which can be considered as out of reach for an average student, has now been available to every student who keeps interest in such courses.

Jinal Makwana



This is the first university of Gujarat that provides this great course with such a good facilities.

The faculties are helpful to us in every possible way. The course material is accurate in both theoretical as well as practical manner.

There is such an amazing central library present over the Gujarat University which is very helpful to the students with all the latest edition of books.

Today's world focuses on computer based accurate decision making process, where AI&ML is key to such solution.

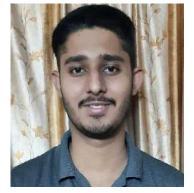


Ashwin Tangevel



For the one year we have covered matrices, mathematical Basics, Algorithms, Python, C, C++ and JAVA, Descriptive statistics and Probability, Numerical and statistical methods, Basics of AIML. Faculties for AI&ML are helping us to great Learning and Understanding. They are teaching us in the method to understand the concept of the particular topics not just mug up. They are friendly to the students. GU has constructed a new Building for the new course. It is good and comfortable. The Air-conditioned classrooms provide comfort for studying. The Laboratories are clean .The Central Library in the Gujarat University is mostly the largest Library contains approximately 4 lakh of Books dept. library contains dept. books.

Rishap Parmar



The Course Content is as per the Industry Standards. Till now we have completed Applications using Python, Predictive Analytics and the experience has been great so far.

Moving forward, they will take us through Machine Learning, Graphical Models, Reinforcement Learning, NLP and AI & Deep Learning.

The best part is it covers all the topics including the Practical. They provide the access to the Cloud Lab to execute all the Codes. I am very happy to be part of this university and specially part of this course. Here we got lots of knowledge and good support of faculties who are striving to make us capable for our career.



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YOGA @ AIML





INFRASTRUCTURE @ AIML







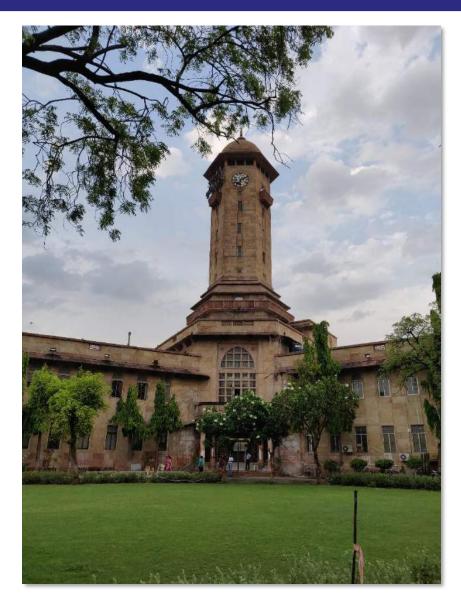
THE CROWNING GLORY : GUJARAT UNIVERSITY





Gujarat University "योगः कर्मसु कौशलम्" (NAAC Accredited B++)







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The oldest and biggest government university Years

260 Acres Campus in the city, with serene green natural surroundings

Affiliated colleges across the state **286**

22 recognized institutes and 24 approved institutes

36 Post graduate university department and 221 PG centers

Students on the campus **5000**

2 Lac Students across all affiliated colleges under the university



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THE CROWNING GLORY : GUJARAT UNIVERSITY



GUSEC

Gujarat University Startup and Entrepreneurship Council (GUSEC) is a non-profit and autonomous unit of Gujarat University support student ideas, innovations, businesses, ventures and startups. GUSEC helps University students in various ways, including :

- Early-stage funding support for prototype development & govt. grants
- Mentorship and guidance support
- Various online tools, resources and services such as Cloud service credits
- All-day co-working space in Gujarat University campus
- Access to University labs and resources
- Support and guidance for filing patents

Students may get in touch with GUSEC at <u>contact@gusec.edu.in</u> or get more information at <u>gusec.edu.in</u>.



THE CROWNING GLORY : GUJARAT UNIVERSITY



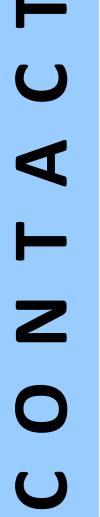
Research Park

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Gujarat University Park for Industrial Extension & Research (PIER) is the first Research and Innovation Park in the country, giving opportunities for students of Gujarat University inclined towards research and innovation get industry exposure, from the Research Park's industry partners, right from within the campus. The Research Park is set up in a sprawling physical infrastructure spreading 4,50,000 sq. ft. out of which 1,40,000 sq. ft. is already being operationalized. For more information on the Research Park, visit www.pier.edu.in.



FOR ADMISSIONS



<u>Contact:</u> **Artificial Intelligence & Machine Learning Five Year Integrated Programs** School of Science, Gujarat University Navrangpura, Ahmedabad (Gujarat) -380009 : +91 93132 90262 / +91 88662 12714 Mobile Enquiry Timings : 11.30 am to 5.30 pm Email : intaimlmsc@gujaratuniversity.ac.in



Send your

enquiry via online

google form on

http://bit.ly/gu-msc

