NURTURING TOMORROW'S LEADERS:
THE CRUCIAL ROLE OF AI AND ML EDUCATION IN K-12 LEARNING

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Common sense is a form of data science. In a very simple sense, data science is a computational form of common sense leading to predictive analytics and generative AI. In the technological world, data science is already making headway. Embracing this technological disruption is the need of the hour. Staying informed about rapidly developing technology is essential for personal and professional growth, innovation, global competitiveness, and addressing the challenges of our time.

Learning Artificial Intelligence (AI) and Machine Learning (ML) is incredibly important for STEM (Science, Technology, Engineering, and Mathematics) students as it has strong relevance in modern technology, great career opportunities, innovation, research, development, and creativity. It has already been introduced to STEM students in some of the schools. AI is about computers mimicking human intelligence.


In ancient history, certain aspects of astrology were based on data science. Some proponents of Indian astrology attempted to use data science techniques to analyze astrological data and identify patterns that might correlate with certain life events or traits. It is often done to provide a more empirical basis for astrological claims. Vedic astrology is one of the forms of data science used for predictions. Now, developed countries use data science to track individuals' organizations so that they can predict via patterns and algorithms.

You can see the use case everywhere. Detective agencies use pattern recognition techniques for anomaly detection by analyzing large volumes of data from social media, communication, financial transactions, and travel records. Natural language processing techniques are used for sentiment analysis. You will find many uses of data science in social network analysis, predictive analytics, risk management, and behaviour analysis.

The most important thing in data science is "data." But the question is, do we have the required data? How much data? Real time? What format? Creating relevant features from raw data is essential for building effective machine-learning models. Keeping the data in most cases, like text files and Excel files, will be a catastrophe if you are handling large volumes. You need to extract sufficient data from various sources properly. Data becomes garbage if the required data is not available. We need to keep this data in a proper format that is compactable. Data is not static. It changes over time, and once effective, models may become obsolete as the data distribution shifts. Data scientists often need to work closely with subject-matter experts to understand the data and its context. Data science projects often require significant computational resources, both in terms of hardware and time. A data warehouse is a central repository of integrated and organized data that is collected from various sources within an organization. It's designed to support business intelligence (BI) activities, reporting, data analysis, and decision-making. Popular data warehousing technologies include Amazon Redshift, Google BigQuery, Microsoft Azure SQL Data Warehouse, and Snowflake. These Modern data warehousing solutions often include both on-premises and cloud-based options, and they can also integrate with data lakes to handle more diverse and unstructured data types.
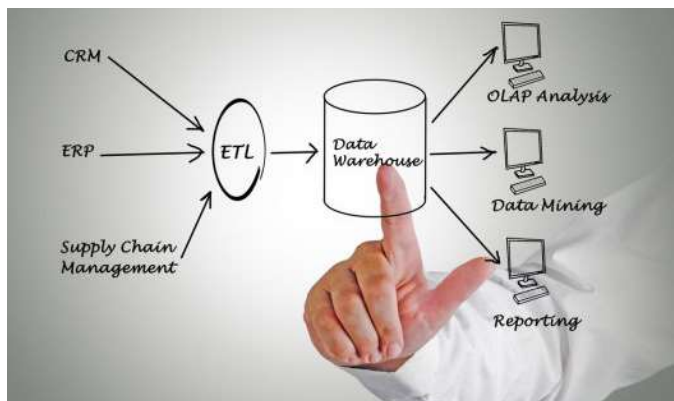
ETL is a critical component of data science and analytics; it stands for Extract, Transform, and Load. It refers to a set of processes used in data integration and data warehousing to move data from source systems to a destination where it can be analyzed, easily queried, and reported.

An ML algorithm is a computational method or procedure that enables computers to learn from data and improve their performance on a specific task over time. These algorithms allow computers to recognize patterns, make predictions, and make decisions without being explicitly programmed for every possible scenario. Ex: linear regression, logistic regression, decision trees, reinforcement learning, random forest, KNN, neural networks, etc. ML algorithms enable data scientists to create models that learn from data, generalize patterns, and make informed predictions or decisions.
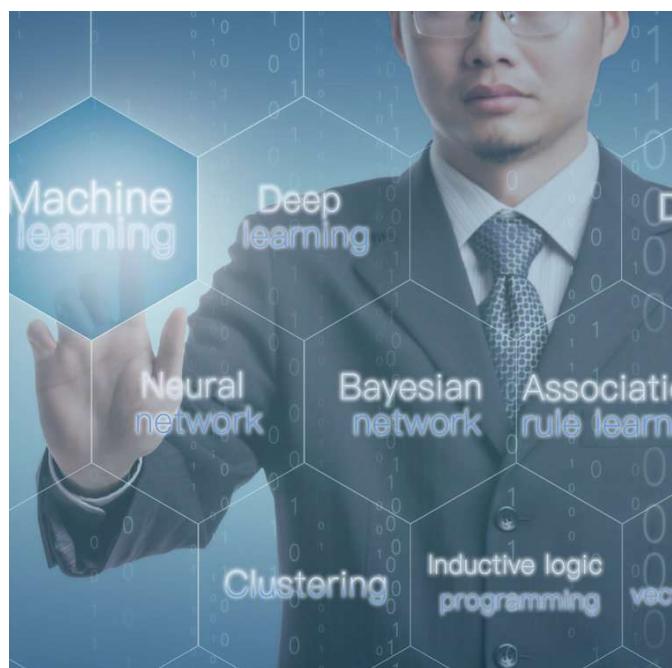
These algorithms are at the heart of modern data science, transforming raw data into actionable insights and driving innovation in various domains. These are useful for Data Analytics (DA) interns in automation-of-decision-making, pattern recognition, prediction forecasting, image analysis, anomaly detection, medical diagnosis, and optimization. It forms the basis for AI to handle larger and more complex datasets, extract valuable information from unstructured data, and automate repetitive tasks, allowing us to focus on higher-level analysis and strategy development.

I work at Altair, a global technology company that works on computational science to drive intelligent decisions and innovations for a more connected, safe, and sustainable future. Altair has 30+ years of experience in the data science and data prep fields, with proven data science solutions for customers in BFSI, retail, manufacturing, engineering, and others. Altair RapidMiner, a well-established desktop, new-gen SaaS cloud-based platform, and new-to-market cloud platform (multi-tenant and SaaS-ready), strengthens Altair's current end-to-end data analytics (DA) portfolio, which offers customers the power to understand, transform, act on, and automate their data.

Generative AI refers to a category of artificial intelligence techniques that involve creating new content, such as images, text, music, or other forms of data, using algorithms and models. Unlike traditional AI systems that are rule-based or deterministic, generative AI systems aim to simulate creativity and generate content that is novel and unique.

There are various online platforms for learning different aspects of AI and ML. I was able to find them via quick searches, such as Code.org, aiworldschool.com, the Swift Playgrounds app by Apple, Teachable Machine by Google, CodeCombat, AI4K12, Mimo, Scratch by MIT, etc. Learning should be a gradual process, and it's okay to start with basic concepts and gradually move towards more complex ideas. The key is to keep the learning experience enjoyable and practical so students remain curious and engaged throughout their journey into AI and ML. Engage students with hands-on activities that illustrate AI and ML concepts. For example, you could guide them through simple programming exercises using tools like Scratch or educational platforms like Code.org.
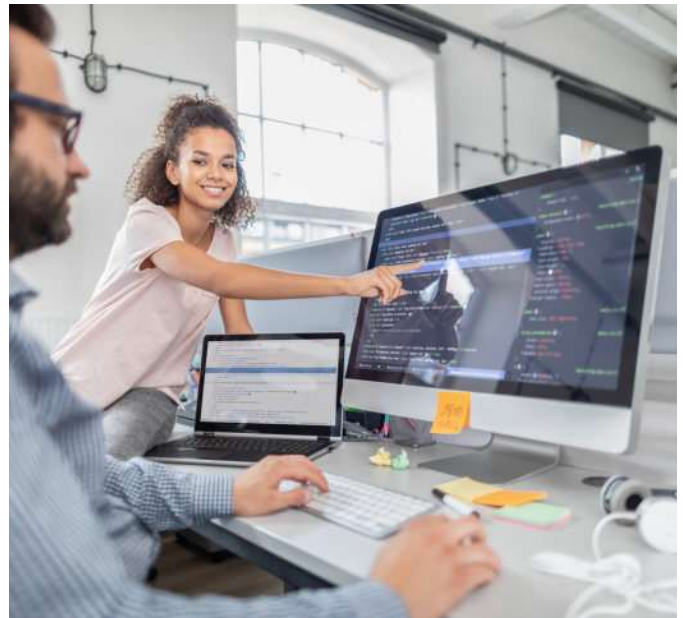
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The author is working as head of academic initiatives at Altair. He is instrumental in Altair India's academic initiatives, viz., incubators, startups, universities, and industry.
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