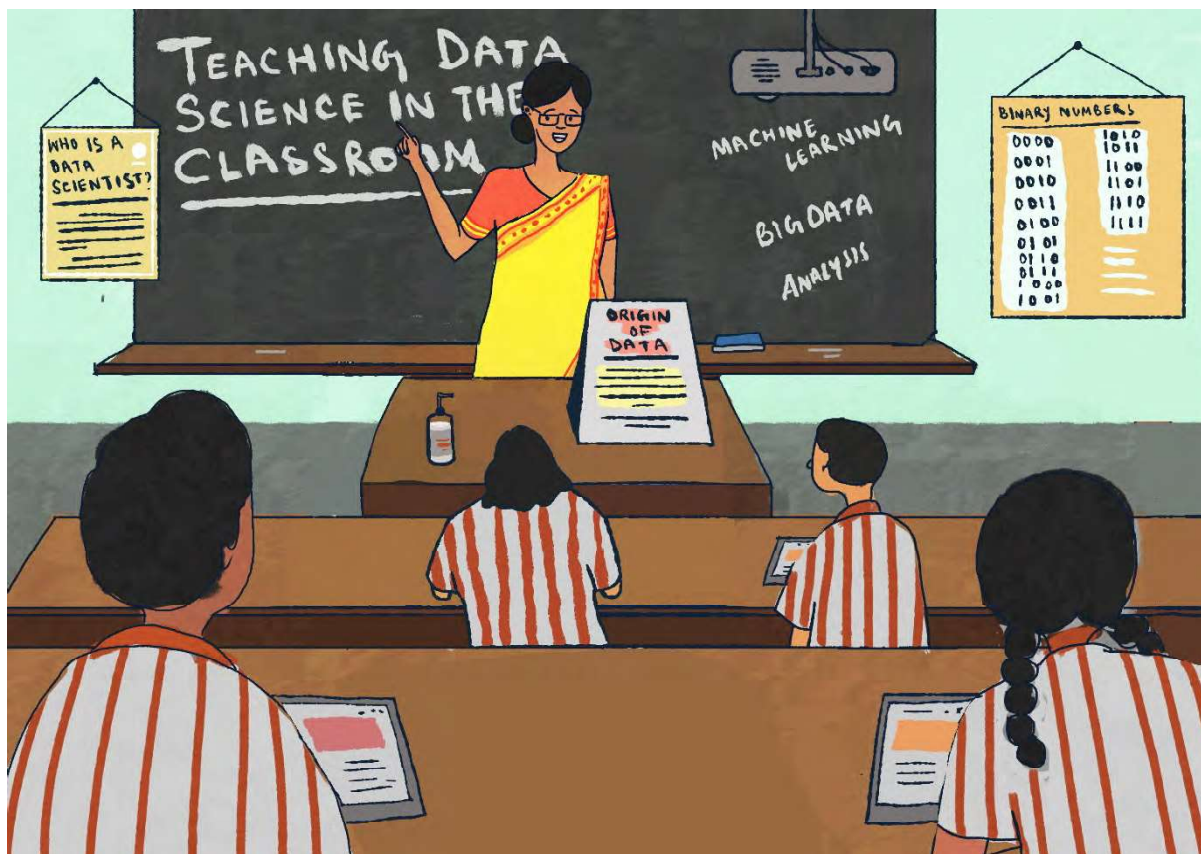


Python is not just a snake! Teaching Data Science in Schools

~ Sujata C



Data science is the science of dealing with or handling data. It is a diverse and interesting discipline which is all about making sense of and extracting precious nuggets of knowledge that lie hidden in mountain heaps of information or ‘data’ as it is termed. A data scientist is a professional who uses scientific methods to make a discovery. Some of the terminologies that go along with data science include ‘machine learning’, ‘big data’, etc. Experts say that a data scientist is a software engineer with a flair for statistics or a statistician who is also good at

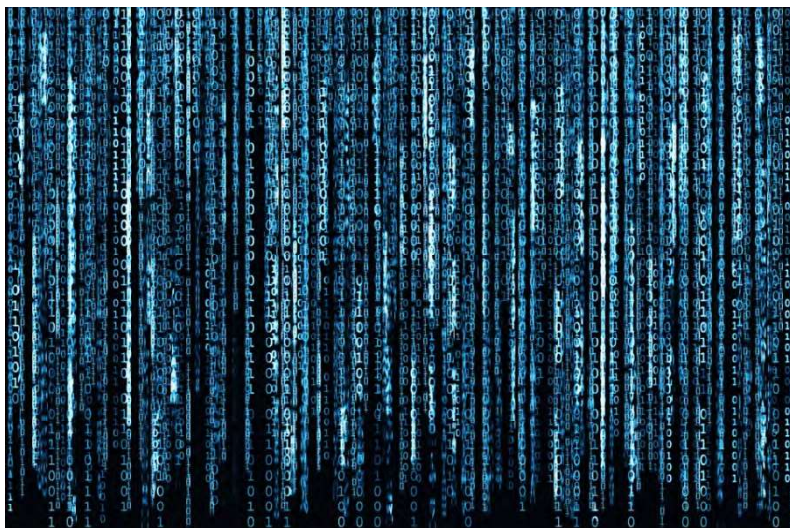
software engineering. They make incomprehensible data easy to understand. Think of data as the new gold and data scientists are the treasure hunters!

inferences
Data analysis raw
webstatistics value
model R driven
big **data** Science
scraping Logic learning
dredging python
computing machine
mining
technology
visualization

If one studies the trends in education, one will observe that in recent times, new disciplines emerge in the education curriculum and job scenarios every few

decades. Jobs that exist today may be non-existent ten years from now as technology evolves and new jobs and consequently new subjects will rise on the horizon of school education. Data science is the new craze. While the jury is still out on whether it is a good idea to teach data science to young children, many schools continue to adopt this new age subject in the curriculum as it helps give students a clear-cut career path.

Origin and evolution of data science: The word ‘data’ originally comes from the Latin word ‘datum’ (meaning, that which is given or information that is available). In the pre-internet days, data was the domain of scientific research, but with the advent of internet, the modern usage of the term “data” also refers to the internet content delivered on mobile phones and other devices.



Data science is technically not a new subject. It has been in existence as academic and applied statistics. A statistician analyses data, big or small, and makes inferences. So the process begins with data analysis – when conventional methods, mathematical and statistical analysis of information were used to understand it, followed by data processing – the conversion of data into information and something of value and relevance with the help of subject matter experts.



Data mining or data dredging is a computer technology process that makes use of algorithms for extracting patterns from large databases that leads to knowledge discovery. By the end of the 1990s, statisticians were officially renamed as *data scientists*. As the size of a database increases, it poses a technical challenge to analyse,

detect linear and non-linear relationships; and this is where computing technology comes in handy to the conventional statistician. Data science teaches concepts that help analyse data.

Current status, future outlook: The beginning of the 21st century saw data science developing as an independent discipline. Models and other tools like predictive modelling and quantitative analysis were developed to study data. The high volume and variety of data generated by the internet led to the boom in data science. In the past decade the emphasis has been on the importance of understanding data, the ability to visualise it, communicate it, make it relevant to people who can use it. This means there are two sets of people: those who deconstruct the data (data scientists) and those who consume it; namely the public, educators, students and workers.



Big data and business analytics are used to generate business insights that will help make the growth plans of companies. According to statista.com, the global big data and business analytics market was valued at 168.8 billion US dollars in 2018 and is forecast to grow to 274.3 billion U.S. dollars by 2022, with a five-year compound annual growth rate (CAGR) of 13.2%. Currently banking and fin-tech companies make the most use of big data and business analytics technology.

At school level, data science is to be seen as skill-based education and can be suggested as one of the subjects under the umbrella of vocational training. It can be suggested for secondary and higher secondary students. There are many games that claim to make data science learning a breeze. Data science finds application in all fields and students can find jobs in sports analytics, bio informatics, retail, finance, HR, or any field of their liking.

Look at the other side: It is important to see things in the context of the current pandemic situation. Jobs have been lost and economies are in a downward spiral. A fear about the future has gripped the human psyche across the world and uncertainty reigns. People are quick to cash in on this and the result is there for all to see. Sensing that parents want to secure the future of their children, some commercial institutions are aggressively promoting workshops for children above 8 years without changing the approach to teaching it. The trouble with any trend in education is that everyone wants to ride the wave and

not be left behind, irrespective of their capacity and capability. When the craze for doctors and engineers began some decades ago many parents pushed their children to study subjects that children were not good in or had interest in. The same thing is happening now. There is parental pressure, peer pressure and the temptation of earning mega bucks in the future. The fact of the matter is that learning data science is not as easy as it is made out to be in the commercials. A data scientist has to eat, drink and sleep statistics and there is a lot of difference between the hype and the reality.

There was a time when for children a python was a frightening snake. But today's children (those who are exposed to data science) will tell you differently. Wouldn't it be a pity if the child was familiar with the python on the computer before he even saw a python in real life? Most important is to check children's interest and aptitude for the subject before being made to study simply because of better job prospects. Children are being introduced to data science, and it is the responsibility of teachers and parents to ensure there is a balance so that a child gets to study other subjects as well as play outdoors.



Sujata C is a writer and editor with more than thirty years of experience. She writes on children, food, environment, society, as well as technology. She has also been a copywriter with advertising agencies for over fifteen years.

Lesson Plan: Introducing Data Science in the Classroom

~ Sujata C



Schools and educators who take on the challenge of introducing data science must reimagine their approach to teaching the subject and train themselves to handle it. Here are a few points for educators to begin with.

1. Most curriculums already offer programming languages such as C, C++ and Java for classes 11 and 12. Include other programming languages like Python and R to make it complete.
2. Hire a data science faculty who can teach the subject from scratch. There will be students of all types in the class, some tech savvy and some not so tech savvy. Make sure the sessions progress gradually from generic to specific and then to more complicated levels. Keeping the teaching sessions non-technical in the initial stages is important to hold the interest of the entire class.
3. Keeping the class interactive is also critical. The engagement levels are an indicator of the involvement of the students. Plain numbers can be boring and lead to disinterest. Introduce interactive templates while presenting the subject to keep up the interest level. Use case studies for illustrations as examples aid understanding and easy grasping.



4. Programming is not easy; it is tedious and tiring. Make sure the pace of the class is right. Be tolerant, positive and encouraging.
5. Data scientists have to develop models. The value of their model must be easy to explain. Teach your students the importance of simplicity.
6. Help students to overcome the fear of failure.
7. Teach them how to read the documentation and find information instead of spoon-feeding them. Students are likely to make mistakes; let them discover it and improve themselves.
8. Strive to find the learning preferences/styles of students.

9. Teach them some soft skills like communication and teamwork because while hard skills are one part of the job, soft skills are equally important as they help translate the hard work into success.



10. Emphasise on critical thinking and curiosity. Encourage them to ask questions.



11. Highlight on the need for analytical thinking – methodical, step by step approach that can help them break down complex problems into single and manageable components.
12. Discuss the ethics of data collection and analysis with your class.



The competition in the field of data science is killing and the expectations do not match the reality most of the time. Have a real-world chat with your class explaining them what the future holds and then check in on those who are serious.

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Protean (adjective)



PROTEAN

Pronunciation: /'prəʊtiən/

Meaning: Tending or able to change frequently or easily; referring to the ability to do many different things; versatile

Origin and additional information: The origin of the word *protean* dates back to the late 16th century and is derived from “Proteus+an”. The word has a mythological origin and has been used at various points in literature from as early as the Greek mythologies to as recent as romantic poets.

Word section: In Greek mythology, Proteus is a prophetic old man who was subject to the sea god, Poseidon. Proteus knew everything about the past, present as well as the future, but like an oracle, rarely divulged what he knew to anyone. It was extremely difficult to bind Proteus to reveal anything because he could assume any shape. He therefore came to be regarded as the symbol of the original matter from which the world was created. The word *protean* came to be derived from Proteus.

Usage:

1. *George Orwell once described England as a protean creature, stretching ceaselessly into the past, forever changing, forever the same.*

(Source: <https://www.lexico.com/definition/protean>)

2. *Nature is more protean than Bacon dreamed: Proteus merely assumes different shapes; nature shifts between whole realities.*

(Source: <https://www.lexico.com/definition/protean>)

3. *All language is protean, a moment-in-time snap-shot of evolution in action.*

(Source: How I Write by Paul Lynch
<https://www.thedailybeast.com/how-i-write-paul-lynch?source=dictionary>)