

Research Analysis of Decision Tree Classifier Algorithm in Machine Learning

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Abstract

A decision tree is a supervised machine learning algorithm that is mostly effective and widely used model. Researchers have considered the problem of extending this classifier studies to variety of fields. This paper studies into the detailed approaches of decision trees Classifier Algorithm so that extensive outcomes can be achieved.

1 Introduction

Machine Learning algorithms has greatly been advanced to such an extent that they are capable of improving automatically when they are exposed to relevant set of data. Advancement into technology has made humans lazy. Decision tree is one such type of Classification based algorithm where prediction happens based on an input feature. This tree based structure contains nodes, links and leaf, where each node represents a feature, decision rule and the outcome. In this paper, a literature review was performed to analyse the most efficient approaches to decision trees algorithms and the findings achieved are summarized. [2][3][1][4]

2 Algorithms

Decision tree algorithms makes the best split for an individual class so that each attributes can be put test at any node so that the resulting partitioned node at each branch of an attribute must be as pure as possible, for that splitting criteria to be identical.

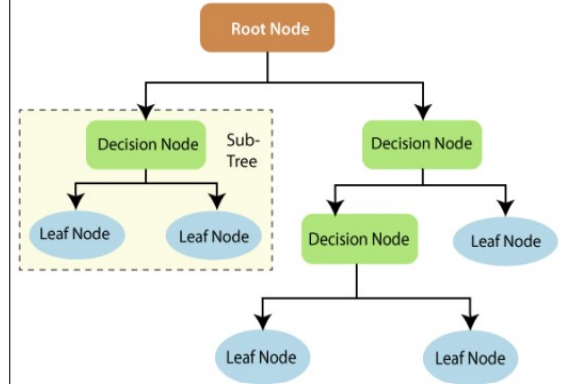


Figure 1: Decision Tree [4]

2.1 Entropy

Impurity or randomness of a data set's is measured by the term Entropy. The value of an entropy always lies between 0 and 1 and its value is better when it is equal to 0 and is worse when it is equal to 1. from [4]

$$Entropy(S) = \sum_{i=1}^c P_i \log_2 P_i \quad \text{from [4]}$$

where P_i is sample subset and i is the attribute.

2.1.1 Information Gain

Information gain is used to predict how an individual feature helps in finding the target variable. Higher is the information gain higher will be the accuracy of the model.[2]

The entropy of subset A is given by the equation

$$E(A) = - \sum_{j=1}^n \frac{s_{1j} + s_{2j} + \dots + s_{mj}}{s} I(s_{1j}, s_{2j}, \dots, s_{mj}) \quad (1)$$

where s_{ij} is sample number,

$$I(s_{1j}, s_{2j}, \dots, s_{mj}) = - \sum_{i=1}^m P_{i_j} \log_2(P_{i_j}) \quad \text{from [2]}$$

$$Gain(A) = I(s_1, s_2, \dots, s_m) - E(A) \quad (2)$$

Decision tree algorithm therefore is very flexible and as well a powerful model, which serves in easy understanding and interpretation of the data

sets. When the data sets are too complex pruning is the method adopted. Higher the information gain higher, the accuracy of the predicted model is very high too.

References

- [1] Lior Rokach and Oded Maimon. “Decision trees”. In: *Data mining and knowledge discovery handbook* (2005), pp. 165–192.
- [2] Qing-yun Dai, Chun-ping Zhang, and Hao Wu. “Research of decision tree classification algorithm in data mining”. In: *International Journal of Database Theory and Application* 9.5 (2016), pp. 1–8.
- [3] Harsh H Patel and Purvi Prajapati. “Study and analysis of decision tree based classification algorithms”. In: *International Journal of Computer Sciences and Engineering* 6.10 (2018), pp. 74–78.
- [4] Bahzad Charbuty and Adnan Abdulazeez. “Classification based on decision tree algorithm for machine learning”. In: *Journal of Applied Science and Technology Trends* 2.01 (2021), pp. 20–28.

MA199 Assignment 4.1: Self-Awareness

14 March 2023 at midday; submit via FASER

Student Registration Number:	2212064
Name of Personal Tutor:	Mr. Jianya Lu

Summary

This assignment is worth **20% of your final MA199 module mark**. This assignment is in 5 parts, where each part is worth 5%. You are expected to reflect critically on your own self-awareness in the context of career decisions and planning. High marks will be awarded to candidates who demonstrate a good level of breadth and depth to their responses. Where possible, you should also provide evidence and attempt to quantify/qualify what you write

Your submitted work is expected to be about 2 pages of A4. You may wish to produce the personal profile document in the self-awareness based lesson on Moodle to help you with this (link is available on the MA199 Moodle page)

The text boxes will expand as you write – you don't have to restrict yourself to the space given.

MA199 Assignment 4.1: Self Awareness

Part 1: In the box below you should **tell your story**. Outline your background, previous education and experiences, values, motivations and give some details about why you are studying your postgraduate course.

Dear Sir/Madam, I am Rahul. My background course was of science stream right after I completed my 10th grade in order to pursue engineering. I enrolled for civil engineering course in 2014. This four-year degree program helped me expand my skills in core modules such as environmental engineering, structural engineering, geotechnical engineering etc. They helped me gain analytical, technical, and critical learning skills which was very useful while entering the industry. Moreover, I completed my under graduation in 2018 from Visveswaraya Technological University. Right after that I prepared for government exams which took me 2 years, since no results were in my favour, I dropped the plan. Later I did multiple freelancing jobs in sales, marketing etc and eventually landed with an internship opportunity as a Data Analyst Intern at ineuron.ai where I served until December 2021. I was responsible for converting the data into actionable insights. Thereafter I joined Minority Welfare Department as a CSE in PMJVK, from January 2022 till October 2022 working as associate. In my break time I tried to gain additional skills by enrolling for many certification programs in Data Science and acquired many new skills required for the industry. Playing around the data and bringing useful solutions where the business can be amplified intrigued me. This motivated me to advance my career in the field of Data Science and its Applications. That is when I enrolled for this programme to increase my knowledge and expertise.

Part 2: When are you at your best? When are you not at your best? Reflect on when you tend to do well, when you feel motivated and driven. Then think about when you tend to feel drained or demotivated.

I am at my best when I will be engaged with a Team of highly motivated people who have complete understanding of the work and are the happiest ones. It makes things go smooth and help reach the best decision and the goal what I have aimed for.

I am feel drained out when things are not organized and are at the peak level and also when team members put too much pressure on me. There were also times when my routine didn't go as per plan to a greatest extent during such periods I was not at my best.

Part 3: What do you consider to be your **strengths**? What do you consider to be your **weaknesses**? Explain your answers - what made you choose these and in what ways do your strengths and weaknesses come out?

MA199 Assignment 4.1: Self Awareness

Strengths: My strengths are working in a team, communicating and being collaborative in the efforts put in by the member to bring out the desired project result. My other strength is sticking to the schedule that is with respect to management of time. For example, when I enrolled for the university, I got part of the i-Teams, Essex Startup. We were tasked to do market research on a startup where we started working in a team of highly talented individuals, during this process my communicative skills helped my team with decision making process.

Weaknesses: Sometimes I look into detailing and tend to be over enthusiastic which I strongly believe is important. This for example have led to disagreements and backfires at my workplace. Now to overcome this I make sure to give equal time to each subpart of the work.

Part 4: Consider your values, motivations and interests (in your personal and professional life) Identify your **3 most important ones** and outline why you chose them and how they impact upon you.

Trust is the most important factor which I value in my personal life. If a trust is broken the relationship with the individual is lost. I choose this because for example it's a matter of fact that all commitments are built on trust and is the building block of any individual or a company to grow. Without trust and commitment there is no growth.

Reading Bhagavat Gita gives me a lot of motivation in both my personal and professional life. Its shows me the way to deal with life and the results are based on my actions alone. Doing good to everyone and expecting nothing in return works wonders is one the best philosophy I found out. That is why I choose this as it motivates me to go strong every day.

My interest is with respect to painting and arts. It brings out my inner creativity and encourages me to think in variety of ways. I choose this as it is a kind of exercise to my brain where my creativity can be brought about with respect to my course where data are analyzed and put in a visualized format.

Part 5: What have you learnt from your answers in Part 1-4? How might this inform your plans for the future, your time at Essex or the actions you might need to take to get to where you want to be?

MA199 Assignment 4.1: Self Awareness

The 1st part of the question helped me understand where I came from and what I am here for with respect to the future when I start working in a corporate sector. It also made me understand where I stood in the job market of UK.

The 2nd part helped me understand and go back to it when I am off track and remember what is that best thing which works for you and which isn't working going well and choose the path accordingly.

The 3rd part of the question helped me re analyze strengths and weakness and play according to it in my life, major projects or in a job.

The 4th part of the question took me to reanalyze important aspect of life and made me note down the clear thought process with respect to values, motivations, and interest which I have been putting forth at the university and where Essex and its diverse culture has provided me with innumerable opportunity.

MA199 Assignment 4.2: Opportunity Awareness

14 March 2023 at midday; submit via FASER

Student Registration Number:	2212064
Name of Personal Tutor:	Mr. Jianya Lu

Summary

This assignment is worth **20% of your final MA199 module mark**. For this task, you need to independently explore and research job roles and job sectors to investigate the graduate labour market. This includes both job roles where a Maths degree is essential, as well as those careers where a Maths degree is useful or can be an advantage. Using the information gathered for your self-awareness assignment you will personalise your research and assess your current labour market position.

This assignment can also be adapted to explore PhD and research opportunities (such as KTPs and operational research), including an evaluation of PhD programmes.

The following events and resources may be useful for this task:

- Careers Centre (including online resources at www.essex.ac.uk/careers)
- Seminar slides on Moodle
- IMA Maths Careers website: <http://www.ima.org.uk/careers.cfm>
- Prospects website: <https://www.prospects.ac.uk/>

For this assignment you will need to do your own personalised and independent research and then undertake the following tasks:

1. Research job profiles and identify one role that interests you and is appropriate to pursuing a career in a Maths-related area.
2. Identify a second job profile that interests you, where a Maths postgraduate degree is not essential, but would give you an advantage.
3. Pick one of the above job profiles and explain in detail what this job involves and the skills needed for success. Reflect on the extent to which you meet the skills requirements for the role.
4. Investigate a job sector that you would like to find out more about. For this sector, explain three key trends in the sector and identify three companies or organisations recruiting in this sector.

In all cases you must explain where you get your information from.

MA199 Assignment 4.2: Opportunity Awareness

The word counts are for guidance only and you will not be penalised for going over / under as long as all relevant information is included.

The text boxes will expand as you write – you don't have to restrict yourself to the space given.

Section 1 – Identify a job role that interests you and is appropriate to pursuing a career in a Maths-related area

In the box below you should outline the results of your research into a Maths related job role.

You must explain the sources where you get your information from. (Word guide – 50 words for each heading.)

1. Job Role: Machine Learning Engineer

2. Typical duties and responsibilities: The duties and responsibilities of a Machine Learning Engineer is that of using exceptional mathematical skills, applying complex algorithms, understanding end to end applications, using of fundamentals of computer science, communicating with business stake holders, building scalable modals, explaining complex process to the non-technical management staff in a simple layman language.

3. Entry Qualifications: The entry qualifications most employers look for is having an undergraduate degree or a masters degree in related fields such as Computer science, statistics, mathematics etc. If we have no degree in the relevant field and just have experience with programming skills such as Python, R, C, C++, Java etc., working with data and statistical analysis is what the employers also take into consideration as entry level qualification.

4. Skills, qualities and attributes required for the role: Demonstrating great mathematical skills, excellent with respect to communication and written skills, ability to explain complex programming in a very simple language, having strong analytical skillsets and giving high attention to details. Have experience working with large data and being innovative in their approaches. Strong programming skills and good subject knowledge with respect to industry working conditions.

5. Professional Development/professional examinations: This can be done through continuous updating of skills and knowledge where in house training is provided in large organizations, taking up additional courses offered by Udacity, edx etc. could be taken up. Other additional skill sets such as management and leadership can be taken up as a part of professional development program.

Sources of information: <https://www.prospects.ac.uk/job-profiles/machine-learning-engineer>

MA199 Assignment 4.2: Opportunity Awareness

Section 2 – Identify a job role that interests you where Maths is not essential but would give you an advantage

In the box below you should outline the results of your research into a job role where Maths is not essential but would give you an advantage.

You must explain the sources where you get your information from. (*Word guide – 50 words for each heading.*)

1. Job Role: Marketing Executive

2. Typical duties and responsibilities: The roles and responsibilities include developing a brand and creating an awareness of the brand, looking for target audience and building relationship with them, helping the team in creating advertisements and campaigns of the brand, promoting on social media channels, doing creative contents for both online and print campaigns, building customer base and updating them.

3. Entry Qualifications: The entry qualifications are open to all graduates and for those who completed their degree in marketing, advertising, business and management, communications, computer science, psychology etc. along with experience, skills and personal qualities, would be the most suitable profile for any recruiters looking for an entry level qualification in this role.

4. Skills, qualities and attributes required for the role: The most important skills in this field is communication, creativity, looking closely onto details, self-motivated, who is able to work under pressure, flexible on work schedule, IT, social media awareness would work as an added advantage, have good rapport while working on teams, having a great influencing factor would be an added advantage.

5. Professional Development/professional examinations: These are usually gathered by attending events, networking within the community, taking up short term courses on data analytics, email marketing, social media marketing, influencer marketing, getting up to date with the latest trends and working with latest technology, reading reports, understanding market sentiments, and learning to capture some of them forms a part of professional development.

Sources of information: https://www.prospects.ac.uk/job-profiles/marketing-executive?gclid=CjwKCAiA3pugBhAwEiwAWFzwdYsHJTJ_ht9zdkoKOIP7_sjhlOtWPDcYphfNHjG9P8ak1J54XLUIhoCp80QAvD_BwE

MA199 Assignment 4.2: Opportunity Awareness

Section 3 – Explore the extent to which your self-awareness of skills meets the requirement of the job opportunity (matching self-awareness to opportunity awareness)

You should choose either the job role identified in Section 1 or the Section 2 job role and explain in detail the skills, quality and attributes needed for success in the role. Revisit assignment 4.1 Self Awareness and reflect on the extent to which you meet the skills requirements for this role.

You must explain the sources where you get your information from.

(Word guide – 200-300 words in total)

1. Job role being investigated: Machine Learning Engineer

2. Skills, qualities and attributes needed for success in the role: Demonstrating great mathematical skills, having strong conceptual knowledge with respect to computer science and software engineering, understanding the Data from analysis and selecting features accordingly, knowing which algorithms to apply while the cross validation based on the feature selection, excellent with respect to communication and written skills, ability to explain complex programming in a very simple language, having strong analytical skill sets and giving high attention to details. Have experience working with large data and being innovative in their approaches. Strong programming skills and good subject knowledge with respect industry working conditions, having time management skills, great domain knowledge, ability to create a prototype, problem solving skills and having desire to acquire new knowledge.

3. Reflection on the extent to which you meet the role requirements: I had basic level knowledge with respect to computer science and software engineering since I have come from different branch of studies. I have the desire to learn new concepts. I do not possess strong programming skills yet I can cope up. I understand the data and can-do data feature selection and find the best possible algorithms required for that data. I can communicate very well with my team and I possess that skill which is a strong quality in me. Able to read and understand complex programme and can prototype it as well. I give attention to detail and possess those analytical skills. Since I manage my time in an efficient manner, that's how I can cope up in the industry while working on multiple complex problems where I will manage time to acquire the desired knowledge and work along with it.

Sources of information: <https://www.knowledgehut.com/blog/data-science/machine-learning-skills>

<https://www.springboard.com/blog/data-science/machine-learning-skills/>

Section 4 – Investigate a job sector you would like to know more about

MA199 Assignment 4.2: Opportunity Awareness

For this sector, explain three key trends in your chosen sector and identify three companies or agencies recruiting in this sector.

(Word guide – 200-300 words in total)

1. Job sector being investigated: Machine Learning Engineer

2. Three key trends in this sector: Three key trends in this sector are with respect to Transfer Learning, Explainable AI, and Edge computing. **Transfer Learning** is one such key trends where the knowledge gained from one machine is used to solve another task. This learning is used when the data available is very small for the training and testing purpose. **Explainable AI** is among the key trends in the health and finance sector where the decisions are made using a AI model, which can later be understood easily by humans and can also have significant impact on them. **Edge computing** is growing at a fast pace where in the technologies are built upon Machine Learning models and these models make decisions sat the edge of a network rather than a centralized one. This technology is used where decision making is very critical like that of self-driving cars.

3. Three companies or agencies recruiting in this sector: Google is actively recruiting machine learning engineers for its research into deep learning and Natural language processing.

Facebook is working on VR where they require many computer vision engineers and is one among the active recruiters in the industry.

NVIDIA uses many Machine learning tasks for its GPU's and requires many ML engineers and are among active recruiters in the industry.

Sources of information: <https://www.techtarget.com/searchenterpriseai/tip/9-top-AI-and-machine-learning-trends>

https://careers.google.com/jobs/results/?company=Google&company=Google%20Fiber&company=YouTube&employment_type=FULL_TIME&hl=en_US&jlo=en_US&q=ai&sort_by=relevance

<https://www.metacareers.com/v2/jobs/3364327873851196/>

https://nvidia.wd5.myworkdayjobs.com/en-US/NVIDIAExternalCareerSite/details/Research-Scientist--Computer-Vision---Deep-Learning_JR1960130

MA199 Assignment 4.3: Decision Learning

14 March 2023 at midday; submit via FASER

Student Registration Number:	2212064
Name of Personal Tutor:	Mr. Jianya Lu

Summary

This assignment is worth **20% of your final MA199 module mark**. For this task, you should create a realistic and achievable career and professional development plan, narrowing down a broad range of potential job roles to more focused goals. You should identify two goals: one career-related and one professional development goal and specify the actions necessary to help you achieve these goals. Each action in your development plan should be prepared using SMART objectives to help you accomplish your goals.

The following resources are useful for this task:

- Seminar slides on Moodle
- 'Career Action Planning' course on Moodle

For this assignment you will need to do your own personalised and independent research and then undertake the following tasks:

1. Identify one career-related and one professional development goal.
2. For each goal identify a number of specific actions you can take to work towards your goal.
3. Set SMART objectives for each action using the template below.

In all cases you must explain where you get your information from.

The text boxes will expand as you write – you don't have to restrict yourself to the space given.

1. **Career-related goal: (for example, exploring a specific job role or sector):** Machine Learning Engineer
2. **Overall target date for achieving this goal:** 1/12/2023
3. **Sources of information:** <https://www.bigcommerce.com/articles/ecommerce/machine-learning/>
<https://www.prospects.ac.uk/job-profiles/machine-learning-engineer>
<https://brainstation.io/career-guides/what-is-a-machine-learning-engineer#:~:text=An%20ML%20Engineer%20builds%20artificial,out%20future%20operations%20more%20accurately.>

What are the Specific actions I need to take to achieve my goal?	What will my Measurable success criteria be?	What support or resources will I need to Achieve this action?	How is this Relevant to my future career plans?	What is the Target date for accomplishing this action?
Earning a degree in that specific field.	Demonstrate end to end understanding of applications.	Getting more hands-on projects.	Researching, selecting the models, and putting in the recommendations for that data set and predicting the outcome.	December 2023

Gaining entry level work experience.	Build algorithms based on Statistical modelling procedure.	Industry training and exposure.	Getting trainings, Industry exposure help in achieving our career developmental goals	August 2023
Communicating with the required stakeholders.	Analyzing large data and finding the most suitable model to apply.	Having most of the computer resources for computation purpose.	Having clear vision and specific path helps me make informed decision about my future career path.	December 2023
Training and evaluating of the models.	Using fundamental of computer science like data structures etc.	Familiarity with respect to Machine learning frameworks and libraries.	Looking into the job role description on the job portal and seeing whether my skills are aligning with the roles posted.	August 2023

1. **Professional development goal: (for example, improve my oral communication skills):** Effective communication
2. **Overall target date for achieving this goal:** 1/8/2023
3. **Sources of information:** <https://www.coursera.org/articles/communication-effectiveness>
<https://www.proofhub.com/articles/good-communication-skills>

What are the Specific actions I need to take to achieve my goal?	What will my Measurable success criteria be?	What support or resources will I need to Achieve this action?	How is this Relevant to my future career plans?	What is the Target date for accomplishing this action?
Paying full attention to body language.	When my messages are clear to understand.	A week-long feedback and coaching workshop on improving effective communication skills.	It helps keeping up with the project timeline.	August 2023
Learn to Ask questions.	When my messages are crisp and concise.	Virtual interactive technology for improving communication efficiency.	It helps me take my team along easily when I start communicating with them in a better way.	August 2023
Giving encouraging verbal cues and using them in the conversation.	When my messages do not create conflicts.	Weekly leadership support and discussions from those who promote effective communication from the industry.	It helps me in managing the projects effectively.	August 2023
Writing down the thoughts which need to be put out.	When my messages are precise and complete.	Supportive working culture groups can be created where they can promote and share their thoughts	Can solve problems easily by asking the right question and later finding out the solution.	August 2023
Understanding the emotions played out while conversing.	When my messages are compassionate.	Providing time and resources can help us in effective communication skills.	Presenting my results to the team manager or client can become easy.	August 2023

MA199 Assignment 4.4: Transition Learning

14 March 2023 at midday; submit via FASER

Student Registration Number:	2212064
Name of Personal Tutor:	Mr. Jianya Lu

Summary

This assignment is worth **20% of your final MA199 module mark**. You are required to search out and find a real postgraduate level job, or postgraduate level training, or further postgraduate study, that you would be interested in applying for, complete the application form and/or write an updated CV and covering letter (making them specific to the position in question), attend an interview, and then reflect on the whole application process.

There are four parts to this assignment:

- i) You must first search out and find the position or postgraduate programme you are interested in. You then need to provide evidence of this position or programme (it must be a real position at postgraduate level or equivalent and a real postgraduate programme). Examples of 'evidence' would be a copy of the job advert, details of the course and institution you are applying for, etc. Note that the postgraduate level position is interpreted in a broad sense and it is fine to include (for example) details of a PhD course you are applying for. You should also write a short reflective statement explaining why you are interested in this position or programme.

(Part i mark is worth 5%)

- ii) You should provide a copy of the application form that you have prepared (if the position or programme has one; a screen grab or picture is fine for this if it is an online form) or alternatively, an updated copy of your CV and a covering letter (adapted and made relevant for this particular position or programme of study).

(Part ii mark is worth 8%)

- iii) You should attend a postgraduate level interview and briefly reflect on how you feel you did and what you learnt from the experience. Note that the interview needs to be at postgraduate level but does not necessarily have to be directly linked to the job application in parts i) and ii) if this is not possible.

(Part iii mark is worth 5%)

- iv) You must write a final short reflective statement about the whole application experience, explaining what was difficult (or easy) and what you would do differently in the future.

(Part iv mark is worth 7%)

IMPORTANT NOTE – you do NOT have to do all these tasks from scratch. If you have already completed a job application or had an interview this year then you can include these experiences in your assignment (as long as the position or programme is a postgraduate level one). Similarly, you don't actually have to have applied for the position in question in reality, as long as you prepare an

MA199 Assignment 4.4: Transition Learning

appropriate application that could be used for this purpose (although if you have done all the work, why not apply anyway?)

If you have not attended an interview for a postgraduate level position yet then you can use the Interview360 system on CareerHub+ where you can set up a virtual interview to test yourself.

Note that you do not have to restrict yourself to the space available in each box of the template (you can expand these or add additional pages to include pictures or pages from your CV for example). Similarly, the word counts mentioned are guides only – you will not be penalised if you write slightly more or if you make all the key points required using less words.

Part i) Evidence and Motivation for Postgraduate Level Position (5%)

In section A you should provide details of the postgraduate level position or postgraduate programme applied for and the date you saw the advert or made the application. This could be a screen grab or picture of the job advert, details of the course applied for, or simply a description of the position and the details of the company. Note that the position must be at postgraduate level!

A:

Include evidence and details of the position or programme applied for here.

14 November 2022

Mr Rahul Kithalamane Basavaraj
LEVERAGE EDU TOWER, A-258, BHI
DEFENCE COLONY, NEW DELHI
DELHI, 110024
INDIA

If you have any questions about your offer please contact:
pgad2@essex.ac.uk
Telephone: 01206 872719

Application number: PG 21183338

Amended offer

Dear Mr Kithalamane Basavaraj,

We are pleased to inform you that your offer is **unconditional** and that you have obtained a place at the University on the following course:

Course:	MSC Data Science and its Applications
Start date:	16 January 2023
Campus:	Colchester Campus
Duration of course:	1 Academic Year
Mode of study:	Full Time
Fee status:	Overseas
Tuition fees (for the first year of study):	£19740

MA199 Assignment 4.4: Transition Learning

In section B you should write a short statement explaining why you are interested in this position or programme and why you are applying for it (*guide – 100 words*).

B:

Include a brief reflective statement as to why you are interested in and applying for this position or programme.

Data Science career is very challenging and requires lot of problem-solving skills, communication skills and innovative approaches in today's advancement with respect to technology. The major challenge is of understanding huge volumes of data, diversity of data and complexity of the data and bring them to logical solutions. In order to find solutions to issues related to data, industry needs data scientists. Pursuing MSc Data science and its applications became indisputable after I found out that there is a huge market in the data driven sectors. Besides that, I had to set up strong foundation in this domain and the fascination to upskill empowered me to look for higher dreams which is when I decided to pursue MSc Data Science and it's applications at the University of Essex. Interest in this field prompted me to apply for this course which contained diverse courses starting from AI and Machine Learning, Big Data for Computational finance, Exploratory data Analysis, Python Programming, SQL, R and Text Analytics. I was pretty sure the knowledge, I would be gaining from this course work will help me achieve my goals which are as well aligned to the industry standards.

Part ii) Application (8%)

In this section you should provide the documentation you used to apply for the position or programme. This can include an online application form (e.g. use the 'print screen' button in Windows to create a screen-grab of the form) or an updated CV and cover letter made specific to the position or programme you are applying for.

You do not need to enter your application details in the box below – you can also insert additional pages into this document if this is easier.

Application documents here or insert as additional pages.

Statement of Purpose (University of Essex)

Data Science and analytics is a demanding career that emphasizes problem-solving and creative thinking in today's fast-paced, technologically driven world. The biggest challenge organizations face today is understanding how to make sense of information and, more crucially, how to take logical decisions as the volume, diversity, and complexity of the information continue to increase. In order to solve data-related concerns, organizations need data scientists. Seeing the demand and growth of this industry, I wish to pursue my career in the field. Alongside, I have set up a solid foundation in the same domain and now I am intrigued to upskill in the domain for higher prospects which is why I decided to pursue an MSc in Applied Data Science at the University of Essex. I believe the course will enable me to study potentially interesting topics emerging from data science, such as artificial intelligence, machine learning, and big data, that I can apply further to support businesses with their business plans.

During my intermediate education, I chose science as my stream in order to pursue my career in engineering. I should have the relevant knowledge and ability to expand my comprehensiveness in the domain. I completed my schooling in 2014. Soon after that, I enrolled in Civil Engineering to strengthen my foundation in the subject. In this four-year degree program, I explored the disciplines which enabled me to expand my skills in core modules like Design of Steel Structures, Environmental Engineering, and Geotechnical Engineering are some of the major disciplines that I studied. It further helped me to build my critical thinking, technical skills, leadership, project management, and analytical skills which I believe are some of the critical skills that one should possess as a civil engineer to better perform projects. Moreover, I completed the course in 2018 from the Visvesvaraya Technological University. Thereafter, I planned to prepare for government exams which took three years, from 2018 until 2021 but later, I dropped the plan when I see no results in my favor. Furthermore, I decided I should apply for a job to enhance my professionalism. I did freelance and eventually, I found an internship opportunity as well, as a Data Analyst Intern, at Ineuron.ai in January 2021 where I served until December 2021. As an Intern, I was responsible for converting data into attentional insights by predicting and modeling future outcomes. Thereafter, I joined as a CSE in PMJVK, from January 2022 till April 2022. Furthermore, I switched to CBSE Cell, Directorate of Minorities, Gok in May 2022 where I am currently working as an Associate. In this job role, I am assigned to implement and maintain administrative systems and procedures, carrying out project research, reports, and data analysis. During the pandemic, I enrolled in a certification program for Full Stack Data Science because I wanted to acquire a new skill, also this program included hands-on instruction and required to create of a new invention, which further intrigued me to find out more and that is the reason, I wish to advance my career prospects by enlarging my understanding in the data concept.

I want to enroll in the MSc Applied Data Science program to increase my knowledge and expertise. This course is set up in a way that will enable me to explore opportunities across a range of fields, from healthcare and technology to finance, so that I may benefit from the expanding employment opportunities in the field of data science. I want to take this course because it will expose me to text analysis and programming with the R language, which further will help me expand my statistical thinking through data visualizations, and show me how to express my creativity within a scientific context. It will go through every important facet of data science and assist me with developing my knowledge and skills in areas like artificial intelligence, deep learning, the digital economy, using R for statistical modeling and decision-making, etc. It all will help me develop the fundamental computational thinking, logical reasoning, sequencing, and algorithmic skills I need to be able to derive insights and knowledge from data. This includes the modules which will introduce me to Programming, Data Science, Machine Learning, etc. It all will help me to enlarge my understanding of the context at large. Since I want to be a professional and wish to hone my skills in the domain, I found it my ideal course to look closely at the issues of business data in order to provide solutions. It will improve my professional practices and performance overall and sharpen and exact my resource management and assessment abilities.

I've always desired to attend a foreign university to pursue my master's degree. I was confident that attending this university would give me the opportunities I would require to develop as a Data Scientist. I

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would have the opportunity to interact, educate myself, and grow alongside diverse cultures, socioeconomic backgrounds, and social systems. My personal and professional development will both benefit from it. These factors ultimately drove my choice to join the University of Essex's master's degree. I prefer this university above others because it will provide me with superior education and enable me to participate in peer-reviewed research. According to the Complete University Guide 2023, the university has also been named one of the top 40 in the UK, which I believe is fantastic news for me as I would benefit from an excellent study environment.

Pursuing this course will certainly help me to achieve my career objectives. This course is structured based on the current market trends and technology which ultimately will aid me to develop highly demanding skills like data analysis and computational thinking, logical skills, sequencing, and algorithms. Furthermore, I could apply all of those to provide solutions to challenges across various leading businesses and IT sectors like IBM, and Google, as a Data Analyst. The experience, knowledge, and technical expertise will further help me to lead my career as a Team leader in the organization, contributing more to the growth of the organization by also contributing as a subject matter expert.

I chose the United Kingdom because of its strong foundation in educational initiatives, that is the reason the universities are recognized worldwide. This is one of the major reasons I chose the United Kingdom as my ideal study destination to further my education in the Data science course. There are numerous opportunities for data scientists in the UK, and the country is investing heavily in research and practice, which I believe is essential in dealing with the challenges of the current market. Due to the lack of this approach in my home country, I decided to pursue it from the United Kingdom. If given the opportunity, I will gain an understanding of a distinct type of education and learning style used by universities, which will enable me to be more innovative and creative, eventually leading to the ability to think independently. Furthermore, with this goal in mind, I decided to pursue a master's degree in the country.

In order for me to better explore while studying and enhance my knowledge in the discipline, I am hoping that the university will take my application into consideration and provide me the opportunity to study at the best university. In this manner, I could give back to the institution by participating in clubs and extracurricular activities that promote personal development.

Rahul

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PROFESSIONAL SUMMARY

Data Scientist with 1+ years of experience using predictive modelling, data pre-processing, data analysis. Hands on experience leveraging machine learning models and Programming skills for solving challenging business problems. Involved in Python [open-source](#) community and passionate about deep reinforcement learning.

SKILLS

Programming Language and Database:
PYTHON, R, HTML and SQL

Frameworks and Libraries:
Pandas, NumPy, Scikit-Learn, Seaborn, Matplotlib

Tools:
Pycharm, IDE, Visual Studio Code IDE, GitHub

Data Visualization Tools:
POWER BI, TABLEAU, R Studio, EXCEL

Machine Learning:
Linear Regression, Logistic Regression, Decision Tree etc.

Cloud Technologies:
AWS, GCP

WORK EXPERIENCE

ASSOCIATE CUSTOMER SUPPORT

[MINORITY WELFARE [DEPARTMENT](#), GOK]

1/2022 - 8/2022

- Providing engaging, accurate, and effective reports and dashboards to board, [executives](#) and other stakeholders on various customer metrics.
- Produce Daily / Monthly Customer Service Metrics (KPI's) and work with the CS Leadership team to identify areas of improvement.
- Monitor and provide solutions to issues submitted through the Business Operations ticketing system.
- Managing ad hoc queries into the team and maintaining a high standard of response.
- Implementing and managing administrative systems and procedures.
- Building mutually beneficial relationships with Customers.

DATA SCIENCE INTERN

[INEURON.AI, BANGALORE]

2/2021 - 12/2021

- Design systematic and automated processes and tools that allow the team to scale and rapidly onboard new datasets.
- Develop Python code, fill databases, and aggregate data to answer key business questions.
- Worked on AI Automation Platform to be implemented for different machine learning datasets.
- Worked closely with Machine Learning engineers to design and deliver end to end scalable machine learning solutions to run models in production.
- Did requirement gathering, HLD, LLD Preparation to build simple, user-friendly reports.
- Design physical data models consistent with our conceptual and logical data models, avoiding data duplication and redundancy
- Develop APIs exposed to our product teams to integrate machine learning into our products.
- Contribute to decisions on infrastructure & architecture

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MARKET RESEARCH ANALYST [FREELANCE]

8/2018 - 12/2020

- Work with clients on defining KPIs and Objectives and their component contributing metrics to establish robust reporting plans and performance measure to distil into key stats and insights.
- Interpret data, formulate reports, perform SWOT [analysis](#) and make recommendations.
- Delivered data-based recommendations to clients that influenced the product roadmap by about 20%.

PROJECTS

AI Automation Platform

- **AIM:** To build a system to scrap reviews for a given product and utilize it to build a sentiment classification model.
- **Technologies Used** – Python, Machine learning, MLOPs, SK-Learn, Flask, MongoDB, AWS Cloud.
- Validate and accept data files as per agreed schema. Perform Feature Engineering.
- Clustering and training classification models with tuning to select a best model for each cluster.
- Select model and predict the type of thyroid based on user data.
- Dedicated folder structure created [so as to](#) save multiple models for different products and use it when required.

Sales data Analysis

- **AIM:** To understand the key metrics and factors and show the meaningful relationships between attributes.
- **Technologies Used** – Python, Excel, [MySQL](#) and Power BI
- Created a dynamic and interactive dashboard for presenting a real-time status of business, monitoring business performance in organizations.
- Analyzed data from 40000 monthly active users and used output to guide the marketing and product strategies team, increased average user engagement by 2x times, 2x shares on social media, 30% decrease in drop off rates.

VOLUNTEER

Community Development Volunteer

Youth for ~~Parivarthan~~

~~February~~ 2018 - December 2022

Prime Minister Narendra Modi commended the work of volunteers of Youth for ~~Parivarthan~~ who have beautified 370 spots across the city and another government-run schools in the city over a span of eight years.

Coding Club

VTEAM - University of Essex

February 2023 - Present

Coding Club helps kids learn the basics of coding and IT and to push them to be better. In order to inspire the next generation.

EDUCATION

University of Essex

MSc Data Science and its Applications

2023 - Ongoing

Visvesvaraya Technological University (VTU)

B.E - Civil Engineering

2014 - 2018

ACHIEVEMENT

Successfully assisted the Innovation Team in recommending [a](#) early-stage startup in Essex, UK gain valuable market insights and enable them to develop strategies to succeed in the competitive world of entrepreneurship.

LANGUAGES

English, Kannada, Hindi

Part iii) Interview (5%)

In section A you should provide details of the interview that you have undertaken. This should be at postgraduate level but doesn't necessarily have to be directly linked to the job application in part i) and ii) (although this is preferable). You should give details of the date, location, who the interviewers were and details of some of the key questions you were asked.

A:

Provide details of the interview here (date, location, interview, key questions asked).

Date: 9/03/2023

Location: Virtual

Interviewers: HR

Details: Graduate/Intern Programme, [The Co-operative Bank](#), Manchester Head Office

In section B you should write a short statement explaining how you feel the interview went and what you learnt from the experience (*guide – 100 words*).

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B:

Include a brief reflective statement about how you found the interview process and what you learnt.

The interview process was very smooth. It started off with the application process where shortlisting of candidates was done. I was shortlisted for next stages of the process. Stage 1 was video interview where the questions were given in advance, and time was given to us to prepare and bring our best self to the video. The questions revolved around personal strengths, values and ethics within banking, key opportunities which will arise in this company over the next 2 years, why I preferred graduate programme and what prompted me to apply for the Co-operative Bank. The upcoming final round of the interview contains Online Verbal & Numerical reasoning test and an interview in the head office. This was the complete process of the interview for the graduate programme.

The things which I learnt from this interview processes are basically not to get discouraged, apply directly on the company website, follow up with the right person with in the company, reflecting on the experience, ready to face tricky questions in the interview, improve job interview skills, gain industry related information, effective means of communication. These are some of the things which I have did learn about from this interview.

Part iv) Reflective Statement about the Application Process (7%)

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In the following section you should write a reflective statement about how you found the whole application process. Questions to think about include: Were you successful with your application (and if not, why do you think this was)? What did you learn from the process? Did you get any feedback from the prospective employer, interviewer or postgraduate provider? What do you think went well (and not so well)? Would you do anything differently with other applications in the future? How does this experience help with your future career planning?

(guide - 250 words)

A:

Include a reflective statement about your application experiences and what you learnt.

Were you successful with your application? I found that the application process went very smoothly in the starting stages and then became extremely stressful at the end, where it felt like the process was taking lots of time, very lengthy and never ending. Finally with the success of the application there came a sign of relief where I felt that the amount of time and hard work I put in was worth it. There was complete sense of jubilation inside me and felt like my dreams of upskilling for higher prospects came true.

What did you learn from the process? Even though I became successful with application it did help me make things clear on to how to improve upon my future applications and their processes, taking constant feedback from postgraduate provider or professors, identify areas which needs lot of improvement, understand how competitive the process is, what is the standard maintained in the applications, the qualifications required to apply, how early to start an application. These are some the important aspects which I learnt during the process of application.

Did you get any feedback from the postgraduate provider? Yes, the postgraduate provider was very pleasant, he informed what is that university will be majorly looking into, what are the challenges faced and by when the next process will start.

What do you think went well (and not so well)? The thing which went well with the application is how I put in my relevant skills, experiences and demonstrated clearly the course I'm applying for in a precise manner.

Would you do anything differently with other applications in the future? No, I would rather proofread the application particulars and submit them without any form of typos or errors. Apply accurately for the role specifically where my qualifications and experiences are matched.

How does this experience help with your future career planning? It is one of the most valuable experiences with respect to my future applications, on how to achieve the goals, skills needed for my career development, being clear on my vision, keeping realistic expectations for my future career planning.

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