Data Science, Mathematics, Applied Mathematics, Statistics, and Operations Research @ Unisa

A guide to preparing for career opportunities

Define tomorrow.

UNISA university of south africa

Contents

The information in this publication is correct as of 10 December 2025. Visit the Unisa Counselling and Career Development downloads page to check for updates.

Please check the Unisa qualifications webpage (http://www.unisa.ac.za/qualifications) regularly for updates related to available qualifications and the admission requirements to study.

How will this brochure help you?

- It will provide you with some insight into what studying in the fields of data science, statistics, mathematics, applied mathematics, astronomy, and operations research involves.
- It will help you to explore the career opportunities and work environments linked to data science, statistics, mathematics, applied mathematics, astronomy, and operations research.
- It will help you gain more information about the skills needed in the fields of data science, statistics, mathematics, applied mathematics, astronomy, and operations research.
- It will assist you with finding relevant qualifications offered by Unisa.

What problems do you want to solve

“Don’t ask kids what they want to be when they grow up but what problems they want to solve. This changes the conversation from who do I want to work for, to what do I need to learn to be able to do that.”

Jaime Casap, Google Global Education Evangelist

One way to think about your career is by focusing on the **problems you care about**, not only on job titles. This shifts the question from *“What do I want to become?”* to *“What do I want to contribute?”*

Activity

1. Write down some problems or challenges you care about — in your family, community, South Africa, Africa, or the world.
2. Think about how you might contribute to solving them.
3. Ask: *What skills or knowledge would I need to prepare myself for that role?*

Example: You may want to address the problem of rising youth unemployment in your community. Think about the range of individuals who can contribute to solving this challenge: data scientists, statisticians, economists, community development practitioners, policy analysts, local government officials, and educators.

A data scientist may analyse labour market trends to identify which skills are most in demand. A statistician could evaluate the effectiveness of youth employment programmes. Someone trained in operations research may develop models to optimise resource allocation for training initiatives. A mathematician might contribute to designing fair and efficient selection or placement algorithms. Meanwhile, educators and development practitioners translate these insights into practical programmes that prepare young people for the job market.

Together, these roles show how addressing complex social and economic challenges requires many people working with different strengths and how your background in data science, mathematics, applied mathematics, statistics, or operations research can equip you to make a measurable and meaningful impact in society.

Before you start…

Before considering pursuing this field of study, here are some basic questions you can ask yourself:

Before considering pursuing these fields of study, here are some basic questions you can ask yourself:

- Why are you interested in studying in this field?
- Where does your interest come from?
- Where are you hoping to be in five years? In ten years?
- What opportunities are you hoping to prepare for by completing a qualification in this field?

Understanding data science

What is data science?

Data science is a multidisciplinary field that uses scientific methods, algorithms, and systems to extract knowledge and insights from both structured and unstructured data. It helps organisations make informed decisions by revealing patterns, trends, and predictive signals in large and complex datasets.

What do data scientists do?

Data scientists tackle open-ended problems by combining domain knowledge, programming, mathematics, and analytics. They collect data from multiple sources, clean and transform it, run statistical or machine learning models, interpret the results, and then communicate actionable insights to decision-makers.

Here are some example questions data scientists might explore:

- "How do customers use our mobile app, and what features should we prioritise next?"
- "Which geographical areas have higher crime risks tomorrow?"
- "Which products should we recommend to a user based on their behaviour?"
- "Can we predict hospital readmission risk for a newborn?"
- "How can we optimise logistics routes to reduce fuel costs?"

Further reading

- What Is Data Science? Definition, Skills, Applications & More
- What is data science?

What skills and knowledge do data scientists need?

Data science draws from many domains. Below is a rough map of key skill areas:

1. **Fundamentals:** mathematics and data modelling
2. **Statistics & probability:** exploratory data analysis, hypothesis testing, regression

3. **Programming:** languages such as Python, R, SQL, and tools like Spark or Hadoop
4. **Machine Learning:** supervised, unsupervised, reinforcement learning techniques
5. **Text / NLP (Natural Language Processing):** mining and interpreting textual data
6. **Data Visualisation:** communicating results via dashboards and visual tools
7. **Big Data:** working with large-scale systems, distributed computing
8. **Data Ingestion & Integration:** collecting, cleaning, merging data
9. **Data Wrangling / Munging:** transforming messy data into analysis-ready form
10. **Tools & ecosystems:** libraries, frameworks, data science platforms

Over time, you may specialise (for example, in ML, NLP, data engineering) or work across a team where each person focuses on a subset of these skills.

Additionally, data scientists need **business acumen**: the ability to ask the right questions, understand domain context, and frame insights so they lead to action. Some describe this as the art of data storytelling.

Role	What they do	Skills	Typical background
Data Analyst	Collects, cleans, and organises data. Creates reports, dashboards, and visualisations to help organisations understand past trends and performance. Focused mainly on descriptive and diagnostic insights ("what happened and why").	SQL, Excel, data visualisation tools (e.g. Power BI, Tableau), basic statistics, Python or R (sometimes). Strong communication skills to present findings.	Statistics, Business, Information Systems, Economics, or Computer Science
Data Scientist	Builds on analyst skills by working with larger, more complex data. Uses advanced statistics and machine learning to predict outcomes and generate	Python, R, machine learning frameworks, data wrangling, cloud platforms, statistics, and business acumen.	Computer Science, Statistics, Applied Mathematics, Physics, or related fields. Many pursue postgraduate study,

	recommendations. Focused on predictive and prescriptive insights ("what will happen and what should we do").	Ability to "tell the story of data."	but some enter via bootcamps or self-study.
Data Engineer	Designs and maintains the infrastructure that makes data analysis possible. Builds pipelines to collect, store, and process data at scale. Ensures reliability, speed, and security of data systems.	SQL and NoSQL databases, big data tools (e.g. Spark, Hadoop), cloud platforms (AWS, Azure, GCP), ETL (Extract, Transform, Load) processes, programming (Python, Java, Scala).	Computer Science, Software Engineering, or related technical disciplines.

How one becomes a data scientist

There is no single path, but some common elements include:

- A strong foundation in mathematics, statistics, and computing
- Formal education (e.g. degrees in applied mathematics, computer science, statistics) or equivalent self-study
- Building a portfolio of data projects (e.g. on Kaggle, GitHub)
- Learning to work in multidisciplinary teams
- Gaining domain knowledge (e.g. in health, finance, logistics)
- Continuous learning as tools and methods evolve

In many cases, data scientists begin in roles such as data analyst, then evolve into more advanced roles or specialisations (machine learning engineer, data engineer, research scientist) as they gain experience.

There are many job titles in the data science ecosystem, but three common categories are **data analysts**, **data scientists**, and **data engineers**. Each plays a distinct role in turning raw data into insights and actions.

Alternative data careers may also include roles related to data product manager, data journalism, analytics engineering, and data ethicists.

Further reading

- Berkeley School of Information – What is Data Science?
- Coursera Career Guide: Data Analyst vs Data Scientist vs Data Engineer

Statistics

What is statistics?

Without realising it, you have probably made some statistical statements in your everyday conversation or thinking. Statements such as “I sleep an average of eight hours a night” and “You are more likely to pass the exam if you start preparing earlier” are statistical in nature. Statistics is a discipline that is concerned with the following:

- Designing experiments and other data collection
- Summarising information to aid understanding
- Drawing conclusions from data
- Estimating the present or predicting the future

Examples of problems where statistics plays an important role can be found in almost all spheres of science:

- The study of the occurrence and spread of disease, and of the effective treatment of diseases, cannot be undertaken without a statistician's input.
- The development of new farming methods relies heavily on statistical techniques.
- When designing and testing new machinery, engineers make extensive use of statistical principles.
- In collecting information about the quality of life of a country's population, the planning, implementation and processing of nationwide surveys rest largely with the statistician.
- Both long-term and short-term insurance are extremely dependent on the correct use of statistics.

Job titles related to statistics

- Actuary
- Biostatistician
- Business analyst
- Data analyst
- Data architect
- Data miner
- Data modeller
- Data modeller specialist
- Data scientist
- Decision modeller
- Decision support analyst
- Financial analyst
- Investment analyst
- Investigator
- Lecturer (university)
- Market research analyst
- Project manager
- Quality analyst
- Research analyst
- Risk analyst
- Statistical analyst
- Statistical assistant
- Statistical clerk
- Statistical modeller
- Statistician
- Survey researcher

Possible work environments related to statistics

- Banking industry
- Business analyst
- Higher education institutions (public and private universities, universities of technology & colleges)

- Insurance and investment companies
- Market research organisations
- Medical research institutes
- Pharmaceutical industry
- Public sector (eg StatsSA)
- Schools
- Self-employment (as a consultant)

Mathematics and Applied Mathematics

What are mathematics and applied mathematics?

A mathematician creates, investigates and analyses mathematical structures to solve and understand mathematical problems. The mathematician tries to find solutions to problems within the medical, agricultural, engineering, industrial, genetic, financial and ecological fields. The work of the mathematician can be divided into two broad categories:

- **Theoretical Mathematics** demands abstract thinking for the development of mathematical theories and methods.
- **Applied Mathematics** involves mathematical modelling, numerical analysis and operational research. It forms a bridge between theory and practice and concentrates on solving problems.

Emerging fields in applied mathematics

There are various exciting emerging fields in the application of mathematics to real-world problems:

- **Computational Biology:** including bioinformatics, genomics, systems biology, protein structure prediction and structural genomics, computational biochemistry and biophysics.
- **Data Mining:** used in customer relationship management; sciences, such as genomics, astrophysics, and chemical engineering; e-commerce; computer security; financial data analysis; medical research and health management; and forensics and fraud investigation.

- **Neuroscience:** investigating the central and peripheral nervous system of biological organisms. This field expanded by the application of mathematical principles to investigate phenomena.
- **Materials Science:** making use of mathematical models and computational tools to design and analyse materials. Materials scientists work in the manufacturing industry, research institutions, the aerospace industry and the engineering industry.
- **Computer Animation and Digital Imaging:** The field of computer animation and digital imaging relies heavily on concepts from mathematics and applied mathematics. People in this field usually work in teams that could include mathematicians, graphic designers, computer scientists, physicists and anatomists. This field has applications within entertainment (e.g. movies and video games), as well as in medical diagnostics and fine arts (dancing, sculpture and painting).

Job titles related to mathematics and applied mathematics

- Actuary
- Business intelligence developer
- Data analyst
- Data quality officer
- Data scientist
- Decision modeller
- Decision support analyst
- Derivatives trader
- Financial analyst
- Investment analyst
- Lecturer (university)
- Market research analyst
- Mathematical assistant
- Mathematician
- Mathematics educator
- Process analyst
- Quantitative analyst
- Research analyst

Possible work environments related to mathematics and applied mathematics

- Banking industry
- Higher education institutions (public and private universities, universities of technology & colleges)
- Insurance and investment companies
- Market research organisations
- Medical research institutes
- Pharmaceutical industry
- Public sector (eg StatsSA)
- Schools
- Self-employed (as a consultant)

Operations Research

What is operations research?

Operations Research (OR) is a systematic and rational approach to problem-solving and decision-making in situations of complexity, uncertainty and conflict. In short, quantitative (i.e. mathematical or numerical) models and techniques are used to find the optimal (best) solutions to quantifiable problems. The multi-disciplinary, computational and systems approach of OR is also known in the business world as Quantitative Management (QM), Management Science (MS), Decision Science, or Operations Management.

What are the tasks of people in this occupation?

Operations Researchers use quantitative techniques and models to find answers for financial, economic and management problems. The aim is to develop alternatives from which the best solution to the problem can be chosen.

In the widest sense, an operations researcher gives support with decision-making problems in just about all fields. The type of problems an operations researcher deals with can vary from decision-making on a national or international level to the day-to-day management of a

small business or factory. On a national level, operations researchers have been involved in the following activities: planning of the 1994 election; determining the optimal use of water resources assisting the government in planning educational, manpower and development policies; assessing conservation and management policies for game parks. Other applications are in mining, banking and other industries.

What are the employment opportunities?

You can work as an operations research specialist within a company. This usually involves general operations research or operations research directed at the company's specialisation area. Examples would be operations research divisions at mining houses, large banks, production companies and even research institutions. Operations researchers are also employed at research and training institutions.

What personal qualities are required?

You should have a mathematical aptitude and be interested in its practical application. You should be able to think clearly and logically and approach a system systematically. Creativity, resourcefulness and initiative are also important qualities. If you have a critical and enquiring attitude and practical insight, then you will enjoy this career. A wide general knowledge and interest in a wide variety of subjects would be an advantage. You must be able to work on your own as well as within a team. It is essential that an operations researcher can grasp a problem and explain solutions in practical, everyday language as well as in mathematical 'jargon'.

Exploring and researching careers

Making informed career decisions means going beyond what you already know. Career research helps you explore opportunities in Data Science, Mathematics, Applied Mathematics, Statistics, and Operations Research, understand what employers are looking for, and identify the steps you can take to prepare yourself.

Try this:

Here are some simple activities to help you explore opportunities in Data Science, Mathematics, Applied Mathematics, Statistics, and Operations Research. Choose 2–3 to start with:

1. **Online search**
   Search “career in data science South Africa” or “entry-level jobs related to statistics” and make a list of the qualifications and skills mentioned.
2. **Occupational information websites**
   Visit the South African Department of Higher Education and Training’s *National Career Advice Portal*. Search for specific job titles and read about work activities, skills, and job outlook.
3. **Job search portals**
   Check portals like Indeed, Career Junction or PNet. Type in specific job titles and see which employers are currently hiring and the requirements.
4. **LinkedIn**
   Search for Unisa alumni who studied data science, mathematics, applied mathematics, statistics, or operations research and see where they work now. What career paths do they follow?
5. **AI tools**
   Use ChatGPT or Google Gemini to ask: “What are emerging careers in data science, mathematics, applied mathematics, statistics, or operations research in South Africa?” Compare the results with what you see on job portals.
6. **Talk to others**
   Set up an informal chat with someone working in the field or at an organisation you are interested in to learn more about their career journey and daily work.
7. **Attend a careers fair**
   When Unisa or professional organisations host career fairs, look for employers related to data science, mathematics, applied mathematics, statistics, and operations research. Prepare 2–3 questions to ask them about entry routes into the profession.
8. **Join a professional organisation or network**
   - South African Statistical Association (Data science group)
   - South African Statistical Association
   - DAMA (Data management Professionals)
   - South African Mathematical Association
   - Southern Africa Mathematical Sciences Association (SAMSA)
   - Operations Research Society of South Africa

9. **Volunteering**
   Look for volunteering or vacation work opportunities. Note the skills you develop through these experiences.

For more detailed steps and extra activities, see our Career Research brochure.

Preparing while you study

Many students believe that a degree will lead directly to a specific job. In reality, your career path is shaped by more than your major. It is also about the **skills you build, the experiences you gain, and how you prepare along the way**. While you study, there are many things you can do to get ready for opportunities.

Your degree is one part of your career journey. By building skills, gaining experience, keeping a portfolio, and investing in your confidence, you'll be better prepared for opportunities during and after your studies.

Develop your transferable skills

Your studies give you subject knowledge and valuable skills such as problem-solving, critical thinking, working independently, and adapting to new situations. Reflect on what you're learning and practise explaining these skills in ways that employers will understand.

Activity

- List three skills you've strengthened this year and one example of how you've used each.
- List three skills you intend to strengthen and how you plan on doing so.

Build a career portfolio

A portfolio helps you keep track of your achievements, experiences, and goals. Include your skills, certificates, volunteering, work experience, and career ideas. Over time, this will become a powerful tool for applications and interviews.

Useful resource

- Unisa Career Portfolio

Gain experience (volunteering or part-time work)

Getting experience outside your coursework helps you explore fields of interest, build networks, and develop workplace skills. Volunteering is especially valuable when done responsibly and with respect for the community.

Think about

- Which organisations could benefit from your skills?
- What could you gain in return (skills, networks, insights)?
- How will this experience link to your career goals?

Enhance your employability

Employability means your ability to get, keep, and grow in fulfilling work. Today's careers are flexible: people change jobs and industries often, and success can mean many different things. You can boost your employability by:

- Managing your personal brand (how others see your professionalism).
- Developing job search skills (CVs, cover letters, interviews, networking).
- Exploring flexible career paths and lifelong learning opportunities.

Useful resources

- Unisa Prepare for Job Opportunities
- Counselling and Career Development YouTube channel
- PNet Grad Pack
- GradNext

Grow your self-confidence

Believing in your ability to succeed is just as important as skills and knowledge. Low self-confidence can hold you back from studying effectively, applying for opportunities, or connecting with others.

Ways to strengthen your confidence

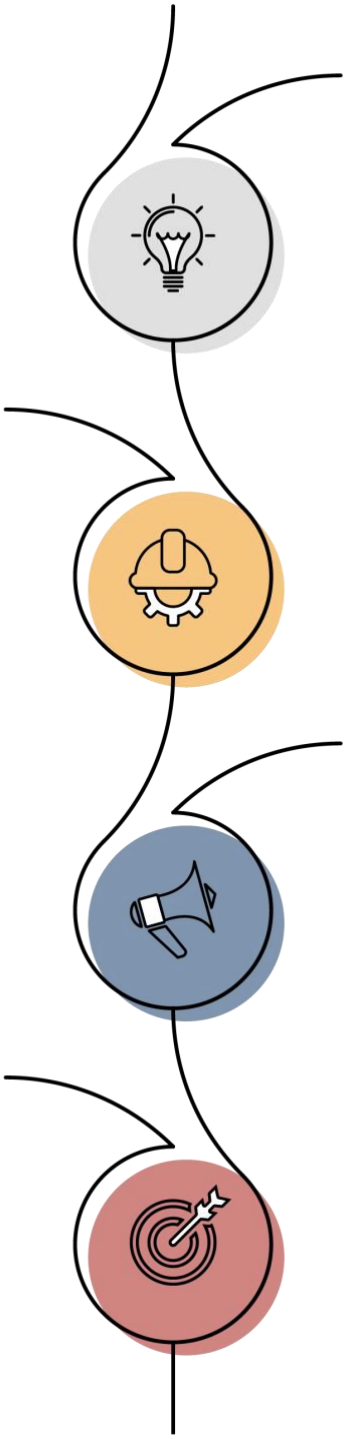
- Focus on your strengths and successes.
- Ask for help when needed: it's a sign of strength, not weakness.
- Practise self-talk that encourages growth instead of fear.

Remember: confidence grows with action. The more you try, the more you'll believe in yourself.

Your roadmap to success

Embarking on a career journey while studying can feel exciting and overwhelming. This roadmap will guide you year by year, helping you to stay intentional, informed, and adaptable.

Careers are rarely straight lines. Think of this roadmap as a flexible guide: you can move between stages depending on your opportunities and goals.



Year 1: Explore and build foundations

- Reflect on your interests, strengths, and career goals.
- Research career paths linked to your qualification.
- Plan your modules and think about postgraduate options.
- Identify key employability skills to develop.
- Create a basic CV and LinkedIn profile.
- Join a student or professional organisation.

Year 2: Grow and gain experience

- Focus on excelling in your studies.
- Apply for internships, part-time jobs, or volunteer work.
- Attend workshops, webinars, or conferences.
- Gain certifications (if relevant).
- Expand your professional network.
- Update your CV and portfolio with new experiences.

Year 3: Refine and specialise

- Revisit your career goals and explore specialisations.
- Connect with alumni and seek mentorship.
- Strengthen your professional presence (LinkedIn, portfolio, personal website).
- Practise with mock interviews and improve communication skills.
- Contribute to professional discussions online or at events.

Final Year: Launch your career

- Start an intentional job search (LinkedIn, job boards, company websites).
- Tailor your CV and cover letters for each application.
- Practise interviews and refine your elevator pitch.
- Attend career fairs and networking events.
- Evaluate and negotiate job offers with guidance from mentors.
- Commit to lifelong learning and professional development.

My career learning plan: Next steps

Your next step is to plan how you will get the information that you still need to make optimal career decisions. Use SMART goals to help you plan your career research.

S – Specific: What exactly do I want to find out?

M – Measurable: How will I know I've done it?

A – Achievable: Can I realistically do this step?

R – Relevant: Does this help me make better career decisions?

T – Time-bound: By when will I do it?

What career questions do I still need answers to?

My career question	What steps will I take?	By when?	Who/what can help me?	Done?	What's next?
E.g. What jobs can I do with a data science, mathematics, applied mathematics, statistics, and operations research qualification?	Search LinkedIn profiles of Unisa data science, mathematics, applied mathematics, statistics, and operations research graduates	15 Oct	LinkedIn, Alumni page	Yes	Connect with 3 alumni

Career planning is not about having all the answers right now. It is about staying curious, setting small goals, and building momentum.

Study opportunities at Unisa

Undergraduate qualifications

College of Science, Engineering and Technology

- Bachelor of Science General (98801 - GEN)
- Bachelor of Science Applied Mathematics and Computer Science (98801 - AMC)
- Bachelor of Science Applied Mathematics and Physics (98801 - AMP)
- Bachelor of Science Applied Mathematics and Statistics (98801 - AMS)
- Bachelor of Science Chemistry and Applied Mathematics (98801 - CAM)
- Bachelor of Science Mathematics and Applied Mathematics (98801 - MAM)
- Bachelor of Science Mathematics and Chemistry (98801 - MAC)
- Bachelor of Science Mathematics and Computer Science (98801 - MCS)
- Bachelor of Science Mathematics and Information Systems (98801 - MIS)
- Bachelor of Science Mathematics and Physics (98801 - MAP)
- Bachelor of Science Mathematics and Statistics (98801 - MAS)
- Bachelor of Science Chemistry and Statistics (98801 - CAS)
- Bachelor of Science Statistics and Physics (98801 - STP)

One of the admission requirements for the above BSc degrees is that you need to have completed Mathematics and Physical Science as subjects on Grade 12 level. If you took these subjects but your percentage was below the requirement for the BSc degree, then you will need to explore the option of applying for a Higher Certificate in the College of Science, Engineering and Technology. Completing a relevant Higher Certificate programme will enable you to meet the requirements for a degree.

Visit the Unisa website at http://www.unisa.ac.za/qualifications for more information about the admission requirements for these degrees.

Postgraduate qualifications

Honours degrees

- Bachelor of Science Honours in Applied Mathematics (98921)
- Bachelor of Science Honours in Mathematics (98923)
- Bachelor of Science Honours in Statistics New Curriculum (98922 - NEW)

Master's and PhD

- Master of Science in Applied Mathematics (98971)
- Master of Science in Mathematics (98977)
- Master of Science in Statistics (98982)
- Doctor of Philosophy in Applied Mathematics (98972)
- Doctor of Philosophy in Mathematics (98979)
- Doctor of Philosophy in Statistics (98984)

Read more about the Research Focus Areas here.

Frequently asked questions

I did not complete mathematics and/or physical science at matric level – can I study mathematics, applied mathematics, statistics or operations research at Unisa?

For the Colleges of Science, Engineering and Technology : No. The admission requirements stipulate that mathematics is one of the requirements. If you did not complete mathematics in matric, you cannot gain access to any of the BSc degrees. More information about the Unisa admission requirements:

College of Science, Engineering and Technology

College of Agriculture and Environmental Sciences

College of Economic and Management Science

I completed maths and science, but my marks were below 50% – what can I do?

You will need to consider applying for admission to a Higher Certificate offered in the College of Science, Engineering and Technology. Visit the Unisa website for more information about the available Higher Certificates and their requirements. Completion of a Higher Certificate does not guarantee you admission to a further qualification since the University also considers the number of available spaces for a specific qualification. Read more about the role of the higher certificate qualifications here.

Counselling and career development services at Unisa

The Unisa Directorate for Counselling and Career Development offers career, academic, and personal counselling services to Unisa students and the broader community. You can talk to a counsellor about:

- **Career decisions.** I am not sure which career path to follow; I don't know which qualification would be best; I want to change my career direction…
- **Career information.** How can I find out more about a career in …
- **Employability.** How do I market myself to employers? How can I look for work? How can I compile an effective CV? How do I go about networking with others? How do I put together my career portfolio? How can I meet potential employers? How can I improve my interview skills?)
- **My studies at Unisa.** How can I get started with my studies? How do I plan my studies? How can I study more effectively? I don't feel motivated to continue with my studies… I feel worried about preparing for/ writing the exams. I failed my exams – what now? I need to improve my reading/ writing/ numeracy skills
- **Personal issues and mental health.** How can I have better relationships with others? How can I cope more effectively with issues that impact my studies?

Contact us

- Send an email to counselling@unisa.ac.za.
- Make an appointment to see a counsellor:
  - In-person at a Unisa Centre
  - Online (on MS Teams)

Further self-help resources for career, academic and personal development

Our website: www.unisa.ac.za/counselling

Our YouTube channel: www.youtube.com/unisacareers