BACHELOR OF DATA SCIENCE (BDatSci)

OPEN DAY

PROGRAMME INFORMATION

BDatSci

Introduction

Interdepartmental and interfaculty collaboration:

This programme is presented in four faculties and choice between 8 focal areas, namely Economic and Management Sciences (3 focals), Science (3 focals), AgriSciences (1 focal) and Arts and Social Sciences (1 focal). The faculty where you are registered for focal area awards the degree.

Minimum admission requirements:

- Overall NSC average of at least 80%, excluding Life Orientation
- Mathematics 80%
- Afrikaans Home Language 60% / English Home Language 60% *or* Afrikaans/English First Additional Language 75%

Selection criteria:

The number of students selected is determined by the Faculty's enrolment plan and may differ from year to year. Should the applicants who meet the admission requirements exceed the capacity of the Faculty's enrolment plan, the criteria of the admission requirements will be used to rank the applicants in order of suitability, and to finalise the list of selected applicants. This means that not everyone who meet the minimum admission requirements will receive an offer.

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Application Process

Dates: Beginning of April to end of July (response expected to be after July, might be earlier)

Selection of programmes: maximum 3 programmes (focal areas are not a programme) – do not apply for two focal areas in same programme

Acceptance: Provisional acceptance letters (successful/unsuccessful) will be mailed for every programme application – need to accept only one offer within 2 weeks after receiving offer

Minimum criteria: If you meet the minimum criteria of all applications, you will receive offer from all of them

Non-response: If no response is received after two weeks after offer is made, the offer is withdrawn

Offers: Offers are provisional offers and not final offers. Final offers can only be made after the grade 12 results. The grade 12 results will determine if you are admitted to the programme based on the minimum requirements of the programme

Where to apply: Under Science faculty programmes for focal area CS, AM and SP – if you are uncertain and to play safe, apply under the EMS faculty as BDatSci (General). You only have to select the focal area next year week before lectures start during official registration.

Note: Only applicants who accepted provisional offers will automatically be considered for final offers after grade 12 results.
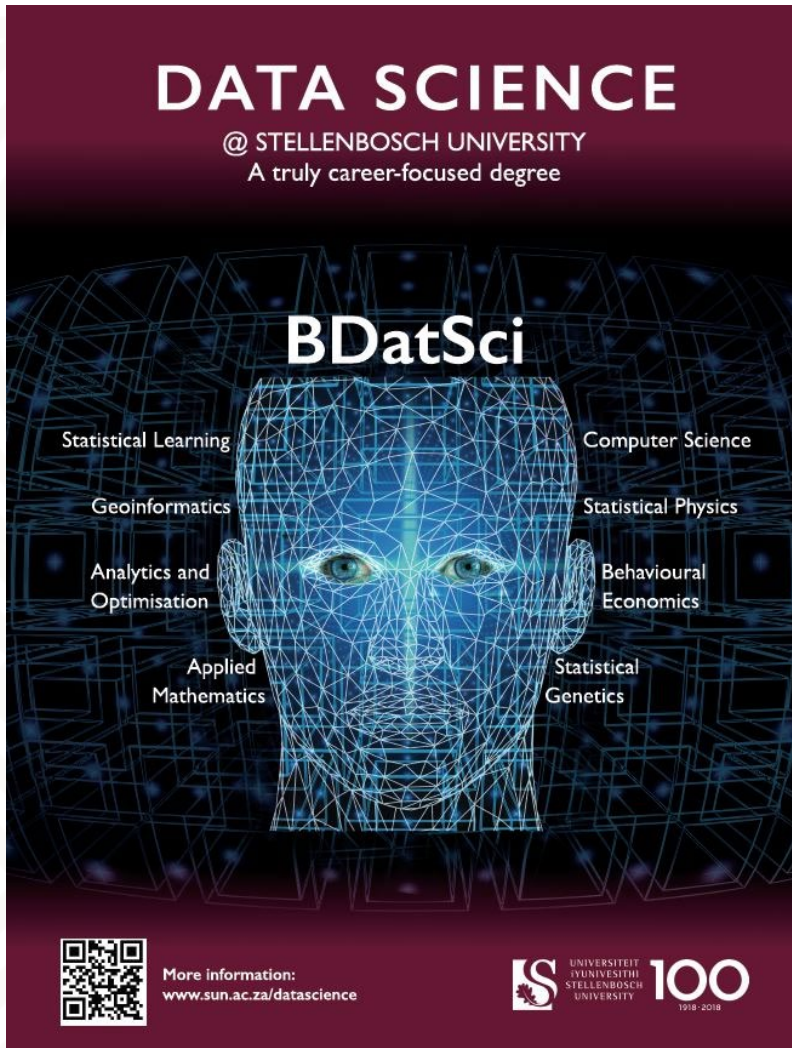
https://www.sun.ac.za/english/maties

Programme and Focal areas

Programme structure

The data science programme BDatSci consists of a set of core compulsory modules in each of the four years of study. The core modules lay the foundation for studies in the field of data science. For the rest, you have a relatively free choice of modules to enable you to focus on a very specific field within the data science environment. Once focal area is finalised at beginning of second year, it remains fixed. You will register for BDatSci in the faculty that offers the focal area.

Focal areas

The objective of focal areas is to help you choose a specific career focus within the BDatSci programme. The focal area is not a programme, and the module combinations are compulsory to make a more focussed Data Science degree. Hence, there are several compulsory modules that must be taken within each focal area. The modules in each focal area fit in with the lecture and assessment timetables. There are eight focal areas in the BDatSci programme.

- **Focal areas with faculties in brackets**

  - Analytics and Optimisation (Economic and Management Sciences)
  - Behavioural Economics (Economic and Management Sciences)
  - Statistical Learning (Economic and Management Sciences)
  - Applied Mathematics (Science)
  - Computer Science (Science)
  - Statistical Physics (Science)
  - Statistical Genetics (AgriSciences)
  - Geoinformatics (Arts and Social Sciences)

BDatSci focal area: Statistical Learning
Faculty of Economic and Management Sciences

Description of focal area (Department of Statistics and Actuarial Science)

In almost all environments, decision-making is driven by massive amounts of data, which means that there is a dire need for skilled individuals who can make sense of this data deluge. In general, data science entails the gathering and storage of data, the transformation and graphical representation of data and the analysis of data in order to make predictions or inferences. The statistical learning focal area entails identifying trends and patterns in data, and using these to construct statistical models, which can be used to predict or classify. This is an important task across all industries, meaning that individuals with these particular skills can work on solving real-world problems found in a variety of domains.

Year 1

Computer Science 113/114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Plus electives between

Actuarial Science 112(8)

Applied Mathematics 144(16)

  or

Economics 114(12), 144(12)

Year 2

Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16), 244(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Operations Research 214(16)

Year 3

Mathematical Statistics 312(16), 316(16), 344(16), 364(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Year 4

Compulsory modules

Introduction to Statistical Learning 441(12)

Machine Learning 441(16)

Data Science Research Assignment 441(40)

Electives (any 4 modules)

Stochastic Simulation 441(16)

Multivariate Statistical Analysis A 441(16)

Multivariate Statistical Analysis B 441(16)

Bayesian Statistics 441(16)

Time Series Analysis 441(12)

BDatSci focal area: Behavioural Economics
Faculty of Economic and Management Sciences

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Description of focal area (Department of Economics)

Data scientists often work with data that capture aspects of human behaviour and reflect decisions made by investors, consumers, workers, politicians, companies and managers. Behavioural economics investigates how psychological and economic factors affect these decisions. This focal area will equip you with the skills, models and theories to understand, predict and influence human behaviour.

Year 1
Computer Science 113/114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Economics 114(12), 144(12)

Year 2
Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Economics 214(16), 244(16)

Year 3
Mathematical Statistics 312(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Economics 318(24), 388(24)

Year 4
Introduction to Statistical Learning 441(12)

Machine Learning 441(16)

Macroeconomics 441(12)

Microeconomics 441(12)

Behavioural Economics 441(10)

Econometrics 441(20)

Data Science Research Assignment 441(40)

BDatSci focal area: Analytics and Optimisation
Faculty of Economic and Management Sciences

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Description of focal area (Department of Logistics)

Operations research is an analytical approach to data-driven problem-solving and decision-making. Problems are broken down into basic components and then solved in defined steps by mathematical methods. Operations researchers use mathematical optimisation to determine the best performance under the given circumstances. They use simulation to experiment and test solutions before implementing them and analytics to uncover risks and helpful insights, and to make reliable predictions. The techniques presented in this focal area give data scientists a unique edge to find optimal solutions to real-world problems, and they open doors to careers in areas like business analysis and consulting.

Year 1

Computer Science 113/114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Plus electives between

Actuarial Science 112(8)

Applied Mathematics 144(16)

  or

Economics 114(12), 144(12)

Year 2

Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Operations Research 214(16), 244(16)

Year 3

Mathematical Statistics 312(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Operations Research 314(16), 352(16), 344(16)

Year 4

Introduction to Statistical Learning 441(12)

Machine Learning 441(16)

Advanced Linear Programming 441(16)

Metaheuristics 441(16)

Methods of Operations Research 441(16)

Systems Dynamics 441(16)

Data Science Research Assignment 441(40)

BDatSci focal area: Computer Science
Faculty of Science

Description of focal area (Department of Mathematical Sciences, Division Computer Science)

Computer Science studies the principles and practice of computation and data processing; it considers problem-solving techniques and data manipulation for everything from routing data over the Internet and powering your social media feeds, to controlling GPS satellites, manufacturing robots, or even your computer.

Year 1

Computer Science 113(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Actuarial Science 112(8)

Mathematics 154(16)

Year 2

Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16), 244(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Operational Research 214(16)

Year 3

Mathematical Statistics 312(16)

Computer Science 315(16), 314(16), 344(16), 345(16), 343(16)

Data Science 316(16), 346(16)

Year 4

Compulsory modules:

Advanced algorithms 412(16)

Computer Science 411(16)

Machine Learning 441(16)

Introduction to Statistical Learning 441(12)

Data Science Research Assignment 471(40)

Elective (any 2 modules):

Functional programming 495(16)

Space Science algorithms 491(16)

Machine Learning & AI 47x(16)

Computer Vision 482(16)

Computing for Data Science 47x(16)

BDatSci focal area: Applied Mathematics
Faculty of Science

Description of focal area (Department of Mathematical Sciences, Division Applied Mathematics)

Applied mathematics looks at real world applications of mathematical methods in fields such as science, engineering, business, computer science and industry. It is therefore a combination of mathematics, science and domain knowledge.

Year 1

Computer Science 113/114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Applied Mathematics 144(16)

Plus one of

Actuarial Science 112(8) or

Physics 114(16)

Year 2

Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Applied Mathematics 214(16), 244(16)

Year 3

Mathematical Statistics 312(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Applied Mathematics 314(16), 354(16), 364(16)

Year 4

Introduction to Statistical Learning 441(12)

Numerical Methods 441(16)

Graph theory 441(16)

Computer vision 441(16)

Digital image processing 441(16)

Machine Learning 441(16)

Data Science Research Assignment 441(40)

BDatSci focal area: Statistical Physics
Faculty of Science

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Description of focal area (Department of Physics)

Statistical physics uses sophisticated maths and simulations to explore and understand the physics underlying everything from quantum mechanics to phase transitions to factory nuts and bolts.

Year 1

Computer Science 114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Physics 114(16), 144(16)

Year 2

Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Physics 224(16), 254(16)

Year 3

Mathematical Statistics 312(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Physics 314(16), 344(16), 334(16)

Year 4

Introduction to Statistical Learning 441(12)

Statistical Physics B 441(16)

Bayesian Physics 441(8) or

Dynamic systems and complexity 441(8)

Lagrange and Hamilton mechanics 441(16)

Applied Markov processes 441(16)

Stochastic Simulation 441(12)

Time series analysis 441(12)

Data Science Research Assignment 441(40)

BDatSci focal area: Statistical Genetics
Faculty of AgriSciences

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Description of focal area (Department of Genetics)

Statistical genetics is the field of study where statistical methods are used to make inferences of genetic data. It is used in fields such as population quantitative genetics by for example plant breeders and conservation geneticists and in genetic epidemiology where the effects of genes on diseases are studied.

Year 1
Computer Science 114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Biology 124(16)

Applied Mathematics 144(16)

Year 2
Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Genetics 214(16), 244(16)

Year 3
Mathematical Statistics 312(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Genetics 314(16), 315(16), 344(16)

Year 4
Introduction to Statistical Learning 441(12)

Genetic data analysis 441(8)

Bioinformatics 441(8)

Scientific and proposal writing 441(8)

Human and animal genetics 441(8) or

Plant genetics and crop improvement 441(8)

Genetics: Molecular Techniques 441(16)

Genomics 441(8)

Machine Learning 441(16)

Data Science Research Assignment 441(40)

BDatSci focal area: Geoinformatics
Faculty of Arts and Social Sciences

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Description of focal area (Department of Geography and Information Science)

Geoinformatics is the science and technology dealing with the structure and character of spatial information, its capture, its classification and qualification, its storage, processing, portrayal and dissemination.

Year 1

Computer Science 113/114(16), 144(16)

Data Science 141(16)

Mathematics 114(16), 144(16)

Probability Theory and Statistics 114(16)

Applied Mathematics 144(16)

Plus one of

Actuarial Science 112(8) or

Physics 114(16)

Year 2

Data Science 241(16)

Computer Science 214(16), 244(16)

Mathematics 214(16)

Mathematical Statistics 214(16), 245(8), 246(8)

Geographical Information Technology 211(16), 241(16)

Year 3

Mathematical Statistics 312(16)

Computer Science 315(16), 343(16)

Data Science 316(16), 346(16)

Geographical Information Technology 312(16), 342(16), 341(16)

Year 4

Data Science Research Assignment 441(40)

Introduction to Statistical Learning 441(12)

Geographical information science research application 441(30)

plus two of:

Geographical information Science 441(30)

Spatial modelling and geographical communication 441(30)

Advanced remote sensing 441(30)

BDatSci and other degrees

What is the difference between BDatSci and the Data Engineering specialist area when studying BEng Electric and Electronic (E&E) engineering?

Computer Science, Mathematical Statistics and Mathematics are modules than can be taken by students of both BDatSci and BEng E&E. BEng E&E students will be required to take more compulsory engineering modules, resulting in an engineering qualification after 4 years. BDatSci will not only present you with a qualification in Data Science, but also allow you to specialise in one of the most sought-after specialist areas (data-rich environments) in Data Science.

Can you change from BDatSci to BCom/BSc after year 1 or 2?

You may, provided you are enrolled for the required modules of the respective degrees. Both BCom and BSc require specific modules as electives and compulsory modules.

Can you switch from BCom Actuarial Science to BDatSci?

Having started with BCom Actuarial Science, the easiest switch to BDatSci is at the end of semester 1 of your first year. After first 6 months Data Science 141 must be taken with CS144 and then follow the rest of BDatSci first year modules. The change to BDatSci will then be official at the end of year 1. The longer you wait, the more BDatSci modules you need to catch up on and extend years of study.

BDatSci and other degrees

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What is the difference between BDatSci and the degrees BCom Mathematical Sciences & BSc Computer Science with focal areas Data Science?

The BCom and BSc degrees are both three-year degree programmes. To register for a Master's degree, you'll first need to complete an Honours degree after the initial three years. The BCom degree do not offer specific *Data Science* modules in the programme; the BCom is more commerce/business orientated while the BSc is more natural sciences orientated. On completion of these degrees, students can register for an Honours degree in any of the majors of their third years. The big advantage of the BDatSci degree is that you will specialise in a very specific data-rich environment by selecting one of the much sought-after focal areas. Your research project in the fourth year is a direct application and specialist research in the particular data-rich environment.

You can do the BCcom (Mathematical Sciences) with focal area Data Science, thereafter the HonoursBCom in Mathematical Statistics which is then equivalent to the BDatSci fourth year of BDatSci with focal area Statistical Learning.

Can you change between the focal areas of BDatSci?

Yes, provided you still take the required modules of the particular focal area. It may mean in certain cases that you need to study more than 4 years to complete the compulsory modules for a specific focal area. The modules of a focal area cannot be replaced by modules in other degree programmes. The easiest focal area to change to at the end of year 2, when starting with any other focal area is to change to focal areas Statistical learning, Computer Science and Analytics & Optimisation. The latter focal area should be made in middle of year 2, the others at the end of year 2. Changing focal areas in year 3 & 4, will add study years to the degree.

BDatSci: Uncertain about focal areas?

❖ **Information session regarding focal areas will be scheduled just before lectures start of the academic year during welcome Maties week. Procedure of registration will be explained, as well as the difference between the various focal areas if you are still uncertain. Students should not register for any modules before attending this session during welcome week.**

❖ **Focal areas are very flexible during the first year: explanations will be provided in February before official registration during Welcome Week.**

❖ **If accepted for any other degree you accepted the provisional offer and still adhere to minimum grade 12 requirements for BDatSci, you can still register for BDatSci in the beginning of academic year.**

BDatSci: Contact Information

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BDatSci website www.sun.ac.za/datascience (FAQ) or general about the programme:

Prof Paul Mostert datascience@sun.ac.za

Focal-specific enquiries:

❖ Statistical Learning: Prof DW Uys (dwu@sun.ac.za)

❖ Computer Science: Prof S Kroon (kroon@sun.ac.za)

❖ Analytics and Optimisation: Prof S Visagie (svisagie@sun.ac.za)

❖ Applied Mathematics: Prof W Brink (wbrink@sun.ac.za)

❖ Behavioural Economics: Prof R Burger (rulof@sun.ac.za)

❖ Geoinformatics: Dr Z Munch (zmunch@sun.ac.za)

❖ Statistical Genetics: Prof C Rhode (clintr@sun.ac.za) or Prof W Botes (wcb@sun.ac.za)

❖ Statistical Physics: Prof K Muller-Nedebock (kkmn@sun.ac.za)

Thank you
Enkosi
Dankie