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Department of Statistics and Actuarial Science

Degree Programmes focussing on DATA SCIENCE

Contents

BCom (Mathematical Sciences)

Admission requirements

- Overall National Senior Certificate average of at least 70%, excluding Life Orientation
- Mathematics 75%
- One of the following: Afrikaans Home Language 50% *or* English Home Language 50% *or* Afrikaans/English First Additional Language 60%

Enquiries

Data Science focal area

- Prof Danie Uys
- E-mail: dwu@sun.ac.za

Focal area: Data Science

Description of focal area

Data is important and is analysed in almost all environments. A data scientist must have the skills for the following: to gather data and to store it, to transform data and graphically represent it, to ask relevant questions and to analyse data so as to answer decision-making questions. Data scientists are employed as statisticians, data analysts, data managers and statistical analysts in, for example, the marketing, information and management positions of firms. In this capacity they form part of the exciting management and decision-making processes in large organisations. If you have this training, you can negotiate exciting and well-paid career opportunities for yourself.

BCom (Mathematical Sciences)		
Focal area: Data Science		
First year (136 credits)	**Second year (124 credits)**	**Third year (134 credits)**
Compulsory modules Actuarial Science 112(8) Computer Science 114(16), 144(16) Economics 114(12), 144(12) Financial Accounting 188(24) Mathematics 114(16), 144(16) Probability Theory and Statistics 144(16)	**Compulsory modules** Business Management 113(12) Computer Science 214(16), 244(16) Mathematics 214(16), 244(16) Mathematical Statistics 214(16), 245(8), 246(8) Operations Research 244(16)	**Compulsory modules** Business Management 142(6) **Recommended elective modules** *Choose any two subjects (all the modules per subject):* Computer Science 314(16) or 315(16), 334(16), 344(16), 354(16) Mathematical Statistics 312(16), 316(16), 344(16), 364(16) Operations Research 314(16), 322(16), 344(16), 352(16)

BDatSci (4-year degree programme)

Interdepartmental and interfaculty collaboration

This programme is presented in four faculties, namely Economic and Management Sciences, Science, AgriSciences and Arts and Social Sciences. The faculty where you are registered awards the degree.

Admission requirements

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

Articulation (changes) to BDatSci from other existing academic programmes is subjected to approval by the BDatSci Programme Committee.

BDatSci … continues

Enquiries

For further information about the BDatSci programme, visit www.sun.ac.za/datascience or use the contact details below.

For general enquiries about the programme:

- Prof Paul Mostert
- E-mail: pjmos@sun.ac.za

For enquiries about specific focal areas in the Faculty of Economic and Management Sciences:

Statistical Learning focal area

- Prof Danie Uys (Statistics and Actuarial Science; E-mail: dwu@sun.ac.za)

Analytics and Optimisation focal area

- Prof Stephan Visagie (logistics, E-mail: svisagie@sun.ac.za)

Behavioural Economics focal area

- Prof Rulof Burger (Economics, E-mail: rulof@sun.ac.za

Note that the other 5 focal areas are in different faculties (see clarification later)

BDatSci … continues

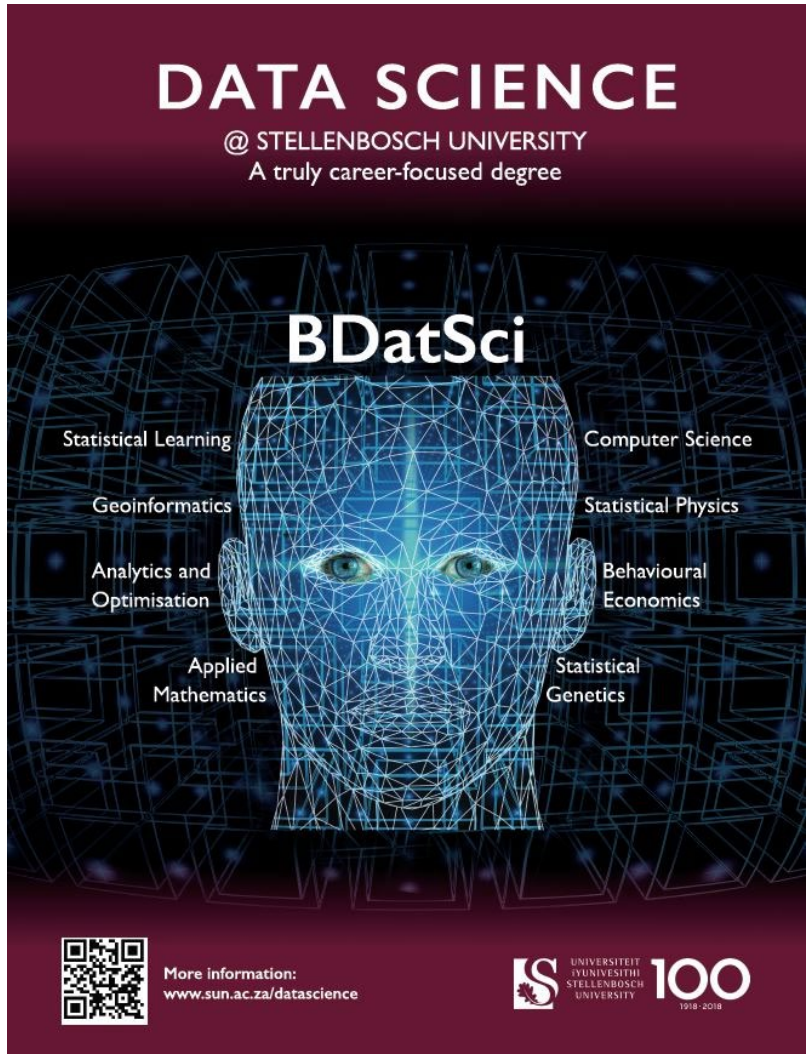
Programme structure

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. It is also possible within this programme to focus on a specific area of study, called a focal area. 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 only recommendations for you to make more focussed module choices. Nevertheless, there are several compulsory modules that must be taken within each focal area. The module choices in the tables describing each focal area fit in with the lecture and assessment timetables. There are eight focal areas in the BDatSci programme, and three of these focal areas are offered in the Faculty of Economic and Management Sciences.

BDatSci … focal areas



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.

BDatSci			
Focal area: Statistical Learning			
First year (120 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (128 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16), 316(16), 344(16), 364(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16)	**Compulsory modules** Introduction to Statistical Learning 441(12) Stochastic Simulation 441(12) Multivariate Statistical Analysis A 441(12) Multivariate Statistical Analysis B 441(12) Bayesian Statistics 441(12) Time Series Analysis 441(12) Machine Learning 441(16) Data Science Research Assignment 441(40)

BDatSci focal area: Behavioural Economics

Faculty of Economic and Management Sciences

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.

BDatSci			
Focal area: Behavioural Economics			
First year (120 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (122 credits)**
Compulsory modules Computer Science 114(16), 144(16) Data Science 141(16) Mathematics 114(16), 144(16) Probability Theory and Statistics 114(16) Economics 114(12), 144(12)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16) Economics 318(24), 388(24)	**Compulsory modules** 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

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.

BDatSci			
Focal area: Analytics and Optimisation			
First year (120 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (132 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16) Operations Research 314(16), 352 (16), 344(16)	**Compulsory modules** 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 Sciences

Description of focal area (Division of Computer Science, School of Mathematics)

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.

BDatSci			
Focal area: Computer Science			
First year (120 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (132 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16), 334(16), 354(16), 345(16) Data Science 314(16), 344(16)	**Compulsory modules** Introduction to Statistical Learning 441(12) Functional programming 441(16) Space Science algorithms 441(16) Concurrent Programming I 441(16) Advanced algorithms 441(16) Machine Learning 441(16) Data Science Research Assignment 441(40)

BDatSci focal area: Applied Mathematics

Faculty of Sciences

Description of focal area (Division of Applied Mathematics, School of 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.

BDatSci			
Focal area: Applied Mathematics			
First year (120/128 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (132 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16) Applied Mathematics 314(16), 354(16), 364(16)	**Compulsory modules** 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 Sciences

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.

BDatSci			
Focal area: Statistical Physics			
First year (128 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (132 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16) Physics 314(16), 344(16), 334(16)	**Compulsory modules** 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

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.

BDatSci			
Focal area: Statistical Genetics			
First year (128 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (124 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16) Genetics 314(16), 315(16), 344(16)	**Compulsory modules** 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

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.

BDatSci			
Focal area: Geoinformatics			
First year (120/128 credits)	**Second year (128 credits)**	**Third year (128 credits)**	**Fourth year (142 credits)**
Compulsory modules 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)	**Compulsory modules** 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)	**Compulsory modules** Mathematical Statistics 312(16) Computer Science 315(16), 34X(16) Data Science 314(16), 344(16) Geographical Information Technology 312(16), 342(16), 341(16)	**Compulsory modules** 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)

More Information

- Consult other information brochures, as well as further slides on the Actuarial Science specific degree programme, as well as the Financial Risk Management focal area, that can be found elsewhere on this website/portal.
- Please view the BDatSci promotional video that explains further detail on this programme. This video focusses on the 8 focal areas. You are welcome to visit the BDatSci website at: www.sun.ac.za/datascience for a lot more information.
- The Departmental website also contains more information about our programmes and general activities at: www.sun.ac.za. Please view our Departmental Newsletters on this link to see who is who, who are alumni, achievements of our students and staff and much more.
- We were proud to have celebrated our 75th anniversary in 2021.

General Contact details:

- Chairperson of the Department: Prof PJ Mostert (021-808-3536 or pjmos@sun.ac.za)
- Departmental secretary: Ms Elizna Huysamen (021-808-3244 or krugere@sun.ac.za)

THANK YOU FOR YOUR INTEREST IN THE DEPARTMENT AND ITS PROGRAMMES