ST422-15 Statistical Consulting

26/27

Department
Statistics
Level
Undergraduate Level 4
Module leader
Martyn Parker
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The module will allow students to gain an insight into the principles, challenges, and applications of statistical consulting. It will equip them with a skill set to become effective statistical consultants, including problem-solving and communication skills. Students will work across multiple disciplines, selecting and applying a variety of statistical methods and tools to address practical problems, and will communicate to various audiences (including non-specialists) the outputs. Students will work with others to develop and present solutions to complex and often ill-defined problems.

Prerequisites (Undergraduates) Students taking this module will need knowledge from following modules:

- ST404 Applied Statistical Modelling or ST344 Professional Practice of Data Analysis;

Students taking this module will find that it has synergies with the following modules:

- ST301 Bayesian Statistics and Decision Theory, or ST413 Bayesian Statistics and Decision Theory with Advanced Topics;
- ST323 Multivariate Statistics or ST412 Multivariate Statistics with Advanced Topics;
- ST346 Generalised Linear Models for Regression and Classification.

Students must be comfortable working with others in a collaborative and constructive manner.

Prerequisites (Taught postgraduates) Students taking this module will need knowledge from following modules:

- ST961 Statistical Methods and Practice
- ST962 Advanced Topics in Statistics and Probability

Students taking this module will find that it has synergies with the following modules:

- ST412 Multivariate Statistics with Advanced Topics;
- ST413 Bayesian Statistics and Decision Theory with Advanced Topics;

Students must be comfortable working with others in a collaborative and constructive manner.

Software prerequisites. It is expected that those taking the module will be able to autonomously and independently use R and other relevant software.

This module is **not** available as an unusual option.

Module aims

The module aims:

- to empower students with an understanding of the principles and practice of statistical consulting;
- to equip the students with the necessary skills to become effective statistical consultants by providing them with opportunities to apply their statistical knowledge in practical situations and to work with those outside of their immediate domain of expertise;
- to enhance students' communication and collaboration skills, as well as their ability to analyse and interpret data, and to present findings to a range of audiences.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module will serve as an incubator for students to act as statistical consultants and will help in the acquisition of
practical skills needed for consulting, including effective communication, teamwork, critical thinking, and problem-solving. The module provides students with the opportunity to apply their theoretical knowledge and skills to practical problems, and thus helps in the preparation for a future career in data science, statistical forensics and work with those in industry. Consequently, there will be the need to work with others confidently and constructively, often in time-constrained situations.
The specific topics covered in the module will vary depending on the consulting projects.

Learning outcomes

By the end of the module, students should be able to:

- Select and apply appropriate statistical techniques and methods to analyse and interpret data
- Communicate complex statistical concepts and findings to a range of audiences
- Use statistical software to conduct data analysis and assess the usage of different software packages
- Identify the different stages of team development and define responsibilities within a team
- Apply critical thinking and problem-solving skills to address practical statistical challenges and make evidence-based recommendations.

Research element

This module contains a research component as students might need to seek and combine information from various sources, may be required to review and analyse existing literature, critically evaluate research methodologies in published studies, adapt and combine in a creative way various methodologies to new contexts.

Interdisciplinary

Depending on the particular consultancy undertaken the module might incorporate an interdisciplinary component, as consulting may involve working with clients from different disciplines and applying statistical methods in various domains.

International

Depending on the particular consultancy undertaken the module might contain some international element, for instance working with and analysing datasets collected from international sources, or even addressing statistical challenges related to cross-cultural research.

Subject specific skills

- Ability to understand and analyse datasets, and to identify potential issues with data quality.
- Ability to work in collaboration with potential clients, to understand their objectives, to apply appropriate statistical methodology, and to provide appropriate recommendations.
- Use statistical software appropriately and effectively.
- Use various statistical models, approaches, theories, and techniques, while being aware of their underlying assumptions and limitations.
- Communicate effectively statistical concepts, methodologies and findings to non-experts, presenting results in a clear and concise manner, using appropriate visualisations and explanations.
- Discuss and critique own and the work of peers.

Transferable skills

- Communication skills: ability to clearly communicate statistical concepts and findings to non-technical stakeholders.
- Collaboration, teamwork and interpersonal skills.
- Project management, managing one’s time, respecting deadlines, setting priorities and managing expectations.
- Understanding ethical guidelines and regulations, e.g. related to data privacy, confidentiality, and responsible data use.
- Adaptability: ability to adapt to different contexts, learn and apply statistical methods to new domains.
- Continuous learning and development: willingness to continuously update one’s skillset and knowledge is valuable for the future careers of the students, as the fields of statistics and data science are constantly evolving.
- Confidence in contributing to the discussions within larger groups in a small conference/workshop environment.

Study

Study time

Type	Required
Other activity	30 hours (20%)
Private study	70 hours (47%)
Assessment	50 hours (33%)
Total	150 hours

Private study description

Students will spend time studying independently and with other members of their team, outside of formal class sessions. These study hours will typically be self-directed or involve collaboration within the team, and will further the students' understanding on consulting in general and on the concrete consulting task/project. Students might need to revisit material acquired in other modules from new points of view, seek information in published sources or engage in independent reading, etc.

Classes will be also provide a structure for engagement with formative work/assessment.

Other activity description

Work in class, training, consultation and examination of case studies. Group presentations and workshops where students deliver and discussion presentations in a conference/workshop-like

environment.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Consultancy portfolio.	70%	40 hours	No

An individual consultancy portfolio comprising of evidence of group contact, actions undertaken and completed, management plan, professional report, executive summary, reflective outputs and a technical report comprising the reproducible code to generate the analysis. An individual will also review elements of other submissions as part of the critical evaluation of outputs.

Due to the nature of the work undertaken and the difficulty in assigning a word count to equations, figures, tables, graphics, data output and computer code, the word count is an approximation and an individual word count may vary depending on the nature of the analysis undertaken. The total length of the portfolio will be no more than 20 pages including figures, tables, graphics, output. Computer code must be well commented and included in a separate appendix which does not count towards the page limit. Submitted code must be reproducible, allowing another person to reconstruct presented results without the need to make any changes.

Workshop presentation and discussion	30%	10 hours	No

Group presentation on the findings of the consultancy together with question and answer discussion in a workshop/conference style.

Assessment group R1

	Weighting	Study time	Eligible for self-certification
Consultancy portfolio.	100%		No

An individual consultancy portfolio comprising of evidence of actions undertaken and completed, management plan, professional report, executive summary, reflective outputs and a technical report comprising the reproducible code to generate the analysis. An individual will also review elements of other submissions as part of the critical evaluation of outputs.

Due to the nature of the work undertaken and the difficulty in assigning a word count to

	Weighting	Study time	Eligible for self-certification

equations, figures, tables, graphics, data output and computer code, the word count is an approximation and an individual word count may vary depending on the nature of the analysis undertaken. The total length of the portfolio will be no more than 20 pages including figures, tables, graphics, output. Computer code must be well commented and included in a separate appendix which does not count towards the page limit. Submitted code must be reproducible, allowing another person to reconstruct presented results without the need to make any changes.

Feedback on assessment

Oral feedback.
Written feedback.
Self-reflection.

Availability

Courses

This module is Optional for:

- TSTA-G4P1 Postgraduate Taught Statistics
  - Year 1 of G4P1 Statistics (Taught)
  - Year 1 of G40B Statistics with Data Science (Taught)
  - Year 1 of G40C Statistics with Finance (Taught)
  - Year 1 of G40A Statistics with Probability (Taught)
- Year 4 of USTA-G304 Undergraduate Data Science (MSci)
- USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics
  - Year 4 of G30A Master of Maths, Op.Res, Stats & Economics (Actuarial and Financial Mathematics Stream)
  - Year 4 of G30J Master of Maths, Op.Res, Stats & Economics (Data Analysis Stream)
  - Year 4 of G30B Master of Maths, Op.Res, Stats & Economics (Econometrics and Mathematical Economics Stream)
  - Year 4 of G30C Master of Maths, Op.Res, Stats & Economics (Operational Research and Statistics Stream)
  - Year 4 of G30C Master of Maths, Op.Res, Stats & Economics (Operational Research and Statistics Stream)
  - Year 4 of G30D Master of Maths, Op.Res, Stats & Economics (Statistics with Mathematics Stream)
  - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics
  - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics
  - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics
- Year 4 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)