UAB
Universitat Autònoma de Barcelona

Quantitative Archaeology

2026/2027

Code: 106858
Credits: 6

Degree programme	Type	Course
Archaeology	OB	3

Contact lecturer

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Group languages

You can consult this information at the end of the document.

Prerequisites

As stipulated by the official degree regulations. A minimum level of knowledge in mathematics is recommended, equivalent to secondary education: basic arithmetic rules, the concept of equation and function. Very important to have some knowledge at user level of computers (Windows, linux or Mac IOS). Very important also to have some experience using Excel or a similar spreadsheet

Objectives

Although most archaeologists may not believe it, archaeology is a mathematical discipline (as once stated by David Clarke), on equal footing with chemistry, physics, etc.

That is, to solve archaeological problems we must use reasoning methods developed in mathematical language. The difficulty lies in the fact that most "humanities" students do not know mathematics. Although there are many software programs that could help us apply these mathematical concepts, the truth is that their use seems too complicated for those without the necessary background.

For this reason, this course has been designed in order to follow a step-by-step program, with easy-to-understand examples of all the techniques used in archaeology, providing schematic, intuitive, simple, and direct documentation of all statistical functions that could be useful for archaeologists.

The introduction to statistical techniques is not based on formulas but rather explains what the calculations performed by a computer program are for.

The course is specially designed for those archaeology students who intend to become future professionals in our field and not only have no idea about mathematics but actually learned to hate it during their school years. Numbers will appear in large quantities, but the operations (arithmetic, algebraic, etc.) will be omitted and replaced with intuitive explanations of what is being attempted with the techniques.

Thematically, the subject is an introduction to classical statistics, initially discussing the quantitative nature of archaeological data and measurements, presenting the most common descriptive statistics, and introducing students to inferential statistical procedures, such as qualitative tests for contingency tables, analysis of variance, study of correlations between variables, etc.

The course explains hypothesis testing techniques and argues the use of these methods to solve archaeological problems.

Learning outcomes

- KM12 (Analytically classify different movable and immovable archaeological materials and remains.) Analytically classify different movable and immovable archaeological materials and remains.
- KM13 (Apply multidisciplinary techniques and methods to the processing and analysis of archaeological records and materials in laboratory and off-site work: analysis of ceramics, industry, archaeozoology, archaeobotany and osteoarchaeology, digital processing and treatment of archaeological images and data, statistics and quantification.) Apply multidisciplinary techniques and methods to the processing and analysis of archaeological records and materials in laboratory and off-site work: analysis of ceramics, industry, archaeozoology, archaeobotany and osteoarchaeology, digital processing and treatment of archaeological images and data, statistics and quantification.
- KM14 (Organise different laboratory activities in archaeology and the processing of archaeological information and images based on the characteristics and requirements of the proposed activity.) Organise different laboratory activities in archaeology and the processing of archaeological information and images based on the characteristics and requirements of the proposed activity.
- SM13 (Apply the main typological classification systems to archaeological materials from different chronologies, taking into account their morphological characteristics, the materials used and the processes of taphonomic alteration and decay.) Apply the main typological classification systems to archaeological materials from different chronologies, taking into account their morphological characteristics, the materials used and the processes of taphonomic alteration and decay.
- SM14 (Apply the main methods, techniques and instruments of analysis in the field of archaeology (obtaining and processing images), and in off-site (digitisation of images, creation of databases) and laboratory work (analysis of different types of archaeological remains).) Apply the main methods, techniques and instruments of analysis in the field of archaeology (obtaining and processing images), and in off-site (digitisation of images, creation of databases) and laboratory work (analysis of different types of archaeological remains).
- SM17 (Use the typical digital and computer equipment and tools for research and professional practice in archaeology in order to represent and order archaeological records (total stations, cameras, specialised software) and to perform analyses of different types of materials (binocular loupes and microscopes, calipers and digital scales, specialised software).) Use the typical digital and computer equipment and tools for research and professional practice in archaeology in order to represent and order archaeological records (total stations, cameras, specialised software) and to perform analyses of different types of materials (binocular loupes and microscopes, calipers and digital scales, specialised software).

Contents

1. Introduction to Quantification in Social Sciences and Archaeology. What does "Statistics" mean? Why is it so important? Text commentary: "Analysis and Explanation in Archaeology".
2. The execrable world of Numbers. Observation, Measurement and Quantification. Text commentary: "Not all numbers are the same. Types of measurements and types of scales".
3. Measurement of Space and Time in Archaeology.
4. From measurements to data. Representation and Coding of archaeological information. Databases. The PAST software.
5. Presentation of a case study (I). Exercise with Excel.
6. Presentation of a case study (II). Exercise with Excel.
7. Classification and Typology. Measurement of Similarity. Introduction to the use of Euclidean distance.
8. Cluster analysis and dendrograms. Practical work with PAST.
9. The concept of variability. Measurement of Variability. Histograms.
10. Measurement of Variability. Univariate Statistics.
11. What is chance? The importance of randomness.
12. Statistical design of a research project. Statistical testing of models and Hypothesis Testing.
13. Contingency Tables and Correspondence Analysis.
14. Contingency Tables and Correspondence Analysis. Practical work with PAST.
15. Contingency Tables and Correspondence Analysis. Practical work with PAST.
16. Comparison of Qualitative and Quantitative Variables. Student's t-test. Practical work with PAST.
17. Comparison of Qualitative and Quantitative Variables. Analysis of Variance.
18. Comparison of Qualitative and Quantitative Variables. Analysis of Variance. Practical work with PAST.
19. Introduction to the concepts of correlation and linear regression.

20. Correlation and linear regressions. Practical work with PAST.
21. Introduction to Principal Components Analysis.
22. Practical work on Principal Components Analysis.
23. General review of all the statistical techniques used throughout the course.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
commented solution of specific archaeological case studies	15	0.6	KM13, SM17
Theoretical introduction to statistical main concepts	10	0.4	KM12, KM13, SM13, SM14
Practical presentation of statistical techniques	15	0.6	KM13, SM13, SM14
Reading specialized bibliographic references	40	1.6	KM12, KM13, SM13, SM14
Using specific software for statistical calculations and data processing	20	0.8	KM12, SM17

Directed Activity - 40%

- Attendance at theoretical classes led by the professor.
- Attendance at seminar sessions and computer practices with specific software led by the professor.
- Classes are held in a special computer lab.
- Comprehensive reading of texts.

Independent Work - 55%

- Personal study.
- Consultation of specialized bibliography. Some of the documentation is in English.
- Use of statistical software. Data analysis work using materials that students can download at the beginning of the course.
- Students are required to have a USB flash drive to carry the distributed data.
- It is advisable for students to have their own computer to perform independent activities using the recommended free software.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Second Study case	45	25	1	KM12, KM13, KM14, SM13, SM14, SM17
Continued evaluation. Exercises to be solved autonomously. Weekly.	10	10	0.4	KM14, SM17
First case study.	45	15	0.6	KM12, KM13, KM14, SM13, SM14, SM17

Course not eligible for single-assessment mode.

Optional weekly graded exercise. Explanation of the task: Thursday. Submission: following Tuesday. These exercises may be done and submitted collectively, in pairs, or in groups of up to 4 students.

Submission of a first case study, with data provided by the teaching staff. This consists of the recreation of an archaeological scenario with numerical data on different aspects of the archaeological record. Students must answer the archaeological question posed, statistically supporting their answer using the data provided and the calculations needed for hypothesis testing. This first case study is solved in class with the help of the teaching staff. The students' task is to integrate all analyses and in-class discussions into a well-structured report, with introduction, problem statement, discussion of the calculations, results and conclusions.

Submission of a second case study, with data provided by the teaching staff. As in the previous case, this involves the recreation of an archaeological scenario with numerical data on different aspects of the archaeological record. In this case, the problem is discussed in class, but students must work independently, identifying the types of analyses that need to be carried out and applying everything that has been learned in class.

The presentation of both study cases is compulsory for evaluation. If only one is presented, the final score will be "not evaluable".

At the time each assessment activity is carried out, the lecturer will inform students (via Moodle) of the procedure and the date for reviewing grades.

Both the first and the second case study must be passed in order to pass the course. If one of the two case studies is not passed, no arithmetic mean will be calculated.

Resit procedure: only the final assignment (second case study) can be reassessed. This decision will be taken case by case after a personalised interview between the student and the lecturer.

The submission date for the reassessment will also be decided case by case, by mutual agreement between the lecturer and the student.

The student will receive the grade "Not assessable" whenever they have failed to submit any of the two case studies.

If the student commits any irregularity that could lead to a significant change in the grade of an assessment activity, that activity will be graded with 0, regardless of any disciplinary process that may be initiated. If several irregularities occur in the assessment activities of the same course, the final grade for that course will be 0.

Erasmus and exchange students who request to advance an exam must present a document from their home university justifying their request.

In this course, the use of Artificial Intelligence (AI) technologies is recommended as an integral part of the development of the assignment, provided that the final result reflects a significant contribution from the student in terms of analysis and personal reflection. The student must: (i) identify which parts have been generated with AI; (ii) specify the tools used; and (iii) include a critical reflection on how these have influenced the process and the final outcome of the activity.

Lack of transparency in the use of AI in this graded activity will be considered a breach of academic integrity and will result in the activity being graded with 0 and not being eligible for resubmission, or in more severe sanctions in serious cases.

Bibliography

REFERENCE TEXTBOOKS:

Victor M. Fernández-Martínez. Arqueo-Estadística. Métodos cuantitativos en Arqueología. AlianzaEditorial.

Shennan, Arqueología Cuantitativa. Editorial Crítica

Barceló, J.A., Morell, B., Métodos cronométricos en Arqueología, Historia y Paleontología. Editorial Dextra.

OTHER REFERENCES (SPECIALIZED)

ABELSON, R.P.., 1998, La estadística razonada: reglas y principios. Buenos Aires: Paidos.

ALBERTI,G.,From Data to Insights. A beginner's guide to cross-tabulation analysis. CRC Press.

BANNING. The archaeologist's laboratory. Springer.

BARCELÓ, J.A:, 2008, Computational Intelligence in Archaeology. Information Science reference, IGI Group. Inc.

BARCELÓ, J.A., BOGDANOVIC, I., Mathematics and Archaeology. CRC Press.

BAXTER, M.J., 2003, Statistics in Archaeology. London, Arnold Publ.

BAXTER,M.J., 1994, Exploratory Multivariate Analysis in Archaeology. Edinburgh University Press.

CARLSON. Quantitative Methods in Archaeology using R. Cambridge University press.

CARRERO-PAZOS, M., Arqueología Computacional del territorio. Oxford. ArchaeoPress.

CHAMBERLAIN, d., 2006, Demography in Archaeology. Cambridge University press.

CONNOLLY, J., LAKE, M., 2009, Sistemas de Información geográfica aplicados a la Arqueología. Ediciones Bellaterra

DE SMITH, M.J., GOODCHILD, M., LONGLEY, P., 2009, Geospatial Analysis. Winchelsea Press. (www.spatialanalysisonline.com)

R.LEE LYMAN Quantitative Paleozoology. Cambridge University Press.

McCALL.Strategies for Quantitative ANalysis. Archaeology by Numbers. Routledge

O'BRIEN & LEE LYMAN. Cladistics and Archaeology. Utah University press.

ORTON. Sampling in Archaeology. Cambridge University Press.

READ. Artifact Classification. A conceptual and methodological approach. Routledge

VAN POOL & LEONARD. Quantitative Analysis in Archaeology. Wiley Publ.

Software

Software Used in the Course

The course uses a very specific software program:

PAST (Paleontological Statistics) - developed by Øyvind Hammer, D.A.T. Harper, and P.D. Ryan.

There are many comprehensive programs for performing statistical calculations, but PAST has advantages:

- It is free, and students can download and install it on their personal computers from

https://www.nhm.uio.no/english/research/resources/past/

- The program is tailored for use in paleontology and archaeology, meaning it includes functions not available in general-use programs (such as cladistics, seriation, morphometrics, and stratigraphic comparison).
- At the same time, it excludes features rarely used in our disciplines, making it more streamlined and less confusing.
- PAST is easy to use and well-suited for introductory courses in quantitative paleontology and archaeology.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	11	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	12	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	13	Catalan	first semester	morning-mixed