

ERG 3910 Research Methodology

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Outline

- 1 Introduction
- 2 How to do research
 - How to choose a research project
 - Investigation methods
 - How to set a problem and solve it
 - Proofs
- 3 Communication of Research
 - Research Output
 - Research Databases
 - Research Evaluation
 - Ethics of Research
- 4 Research Funding
 - Economy of Research

Goals of this course

Give students (subjective) informations about

- What research is
- Why research is important for the society
- Who are the researchers
- How to do research
- How to communicate research

... in few words, how to become a “good” researcher.

Assessment

60% Report and proposal

40% Class presentation

- Each student is expected to hand in a report/proposal of about 8 pages and input it in a standard GRF request. The research topic is arbitrary.
- Each student is also expected to give a presentation (approximately 10 minutes long) on his/her proposal.

What is knowledge?

Expertise or skills that are commonly shared by a group of people
~> independence from individuals.

- Notion of “truth” and conviction
- Relativity of knowledge
- Links with culture and language

Epistemology: branch of philosophy studying how knowledge is built in sciences. Plato, Descartes, Kant, Popper etc...

What is research?

The process that leads to the interpretation/improvement/increase of knowledge. So, what research is

- a *collective* activity
- a *creative* process—sometimes individual
- a *new* understanding of a common knowledge

and what research is not

- a *solitary* work—contrary to the popular belief
- an *unmodified* application of common knowledge

Types of research

- Theoretical: not immediately connected to an obvious application; e.g., cosmology, knot theory, etc...
- Applied: linked to an application; e.g., lasers, ultrasound imaging, speech recognition, etc...
- R&D: development of new products, by using known techniques

Where are the researchers?

More precisely, which part of the society is involved in research?

- Academia: Professors, PhD students
- Some governmental (e.g., meteorology, frequency management) and non-profit organizations
- Industry: Engineers, PhDs

Two opposite cases:

- Medicine, biology
- Pure mathematics

Methodology

As for anything, in order to start doing research, it is necessary to learn

- What are the *purposes* of the game
- What are the *tools* at our disposal
- The *rules* of the game

In addition, since the creative part is essential, we need to know

- What is *novelty*
- How to *create* novelty
- How to ensure that this *adds* knowledge to the collectivity

Methodology encompasses all these steps.