# Intro to Research / Conference Cycle

Natalia Kushik

# Course objectives

Hopefully, after the class you guys, will have an idea about…

- What is research?
- Why is it popular or why is it not?
- How to approach a research project?
- How to actually do it?
- What is to be autonomous in your project?
- How to present the results?
- What is to give a feedback on the projects of your colleagues?
- …

# Starting from the basics...

## What is Research?

**research**

*noun* [ U ] · **UK** 🔊 /rɪˈsɜːtʃ/ **UK** /ˈriː.sɜːtʃ/ **US** 🔊 /ˈriː.sɜˑtʃ/ **UK** /rɪˈsɜˑtʃ/ UK ALSO

**researches** [ plural ]

⭐ B1 **a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding:**

*That is from dictionary.cambridge.org*

*That is from oxforddictionaries.com*

(also **researches**)

1 The systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.

# What about the etymology of Research

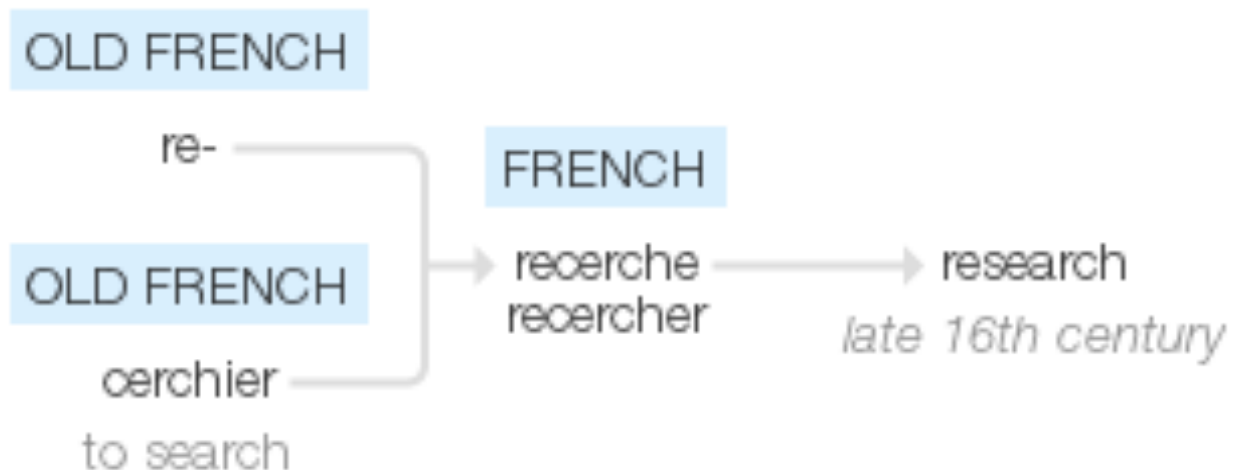Online Etymology Dictionary says

**research (n.)**

recercher (see **research** (v.)). Meaning "scientific inquiry" is first attested 1630s. Phrase **research** and development is recorded from 1923.
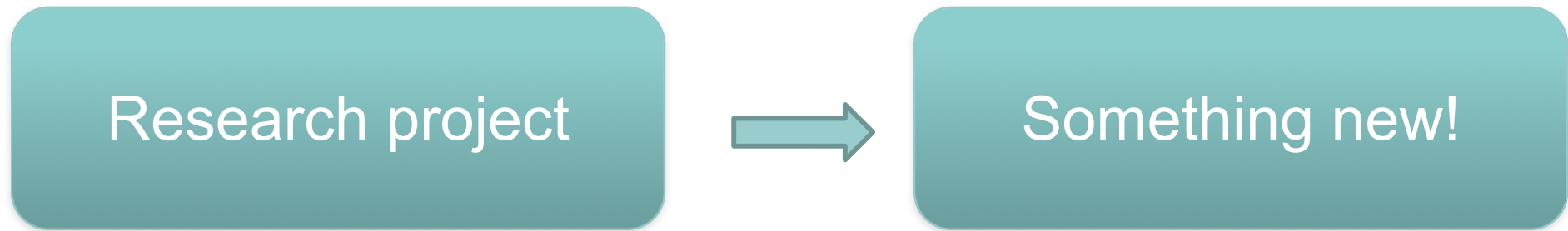
**research (v.)**

1590s, from Middle French recercher, from Old French recercher "seek out, search closely," from re-, intensive prefix (see re-), + cercher "to seek for," from Latin circare "go about, wander, traverse," in...

Google returns it in a nice picture...

OLD FRENCH

re-

FRENCH

OLD FRENCH

recerche
recercher

research

late 16th century

cerchier

to search

4

# Point is…

| Research project | → | Something new! |

- ○ Usually "something new" means to produce something that didn't exist before
- ○ Something new can be a new tool
- ○ Something new can be a new knowledge
- ○ Something new can be a new equipment
- ○ ...

# Research can be...

**Fundamental** & **Applied**

- Sometimes refereed to as 'basic' as well
- Main goal is to get the knowledge

- Solving practical problems
- Main goal is to solve a practical challenge

*Ideally, they form a perfect tandem and complement one another*
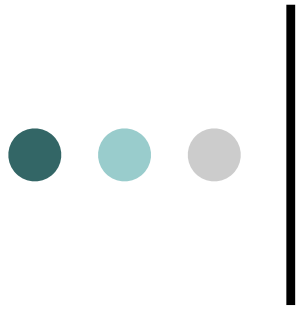
# But what are we going to do?

- ○ We will start by obtaining some new knowledge and sharing it with our groupmates
- ○ This knowledge will be mostly analytical at this stage
- ○ You will have individual assignments on CS and Networks' related subjects
- ○ We will exchange our new knowledge through presentations and related feedback

*Our main interaction is in a form of a seminar*

You can choose your own subject or here's a list of projects that can be considered…

7

# Project No 1

# Evolution of Networks: accomplishments and perspectives
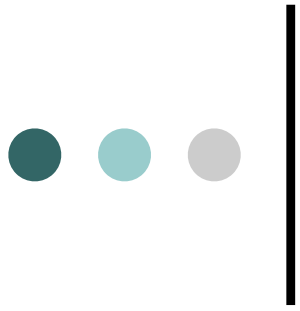
*What do you think it's about?*

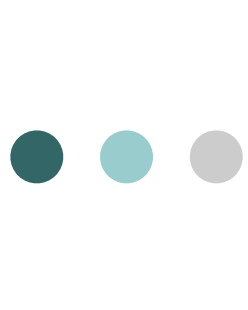# What should be done during this project?

We suggest that you

- Study *'how Internet appeared'* ☺

- Study the main stages of networks' development

- Prepare a corresponding timeline

- Study recent advances, including 5G -> 6G

- Draw conclusions, share with your groupmates your perspective about the Future Networks

- Present your results

# Project No 2

# Estimating Software Quality: functional and non-functional requirements
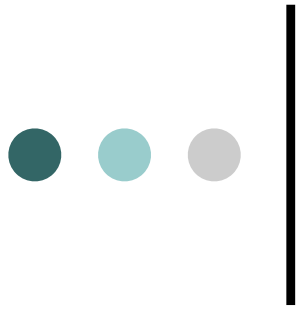
*What do you think it's about?*

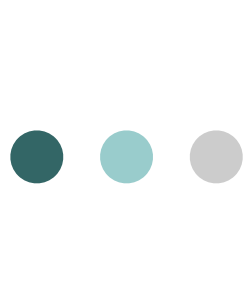# What should be done during this project?

We suggest that you

- Study the parameters utilized for measuring software quality

- Classify them into functional or not

- Study several metrics for these parameters

- Synthesize these data in a table or a schema

- Try some software and measure its quality

- Draw conclusions, advice your groupmates which parameters are rather crucial, which have a correlation between them, etc.

- Present your results

# Project No 3

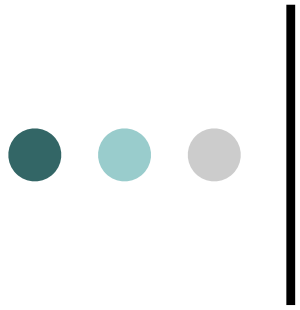# Quantum Computing: Applications and Impact in Computer Science

*What do you think it's about?*

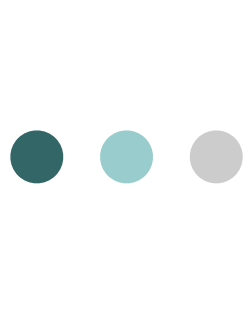# What should be done during this project?

We suggest that you

- Study the main idea behind Quantum Computing

- Study the evolution of this discipline

- Study the impact in Information Security and Computational Complexity (and maybe other fields)

- Present an example of a problem when a complexity gets reduced

- Draw conclusions about the current state and perspectives in Quantum Computing

- Present your results

# Project No 4

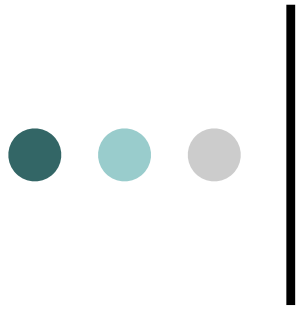## Artificial Intelligence: new era in Computer Science?

*What do you think it's about?*

# What should be done during this project?

We suggest that you

- Study the main accomplishments in the area of AI, and maybe their chronology

- Study the current application areas of AI

- Study the advantages and disadvantages of the AI techniques applied in various domains

- Classify the existing techniques and present a comparison between those

- Draw conclusions about the current state and perspectives in AI
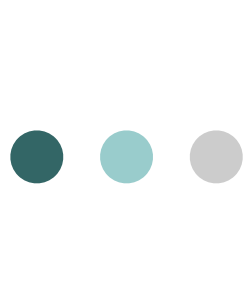
- Present your results

# Project No 5

# Mathematical Models in Networks: related problems and complexity issues
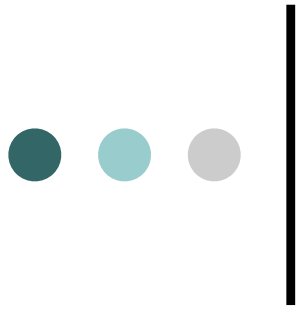
*What do you think it's about?*

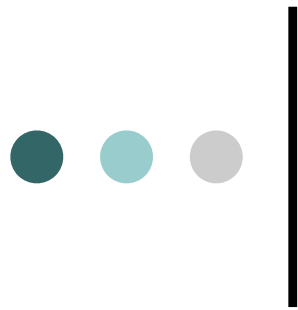# What should be done during this project?

We suggest that you

- Study the major CS problems that arise in the area of networks' analysis and management

- Study the models widely utilized in networks' analysis

- Study the related problems of analysis and synthesis over these models

- Classify the existing techniques for such analysis and synthesis and related complexity issues

- Draw conclusions about the effectiveness of the existing formal approaches in networks' analysis and management

- Present your results

# Project No 6

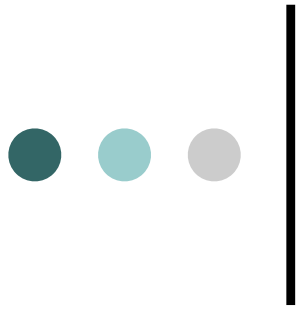## Quality of Experience and End Users as stakeholders in Networks

*What do you think it's about?*

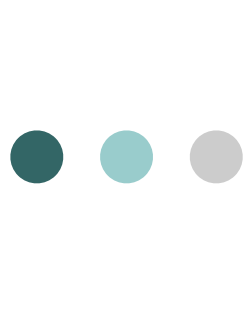# What should be done during this project?

We suggest that you

- Study the notion of the QoE

- Study the related network parameters

- Analyze the motivation of the QoE consideration and the importance of end-users for various networks

- Study the existing techniques for the QoE evaluation

- Draw conclusions about the effectiveness of these techniques for various services / networks

- Present your results

# Project No 7

# Security and Cybersecurity in Real World

*What do you think it's about?*

# What should be done during this project?

We suggest that you

- Study the notions of security and cybersecurity

- Study recent advances in the related areas

- Study the notions of trust and privacy and their criticality in computer networks

- Study the relevant attacks

- Try relevant existing software solutions, such as IDS, vulnerability scanners, key generators, etc.

- Draw conclusions about the current state of the art and perspectives (in terms future crisis?)

- Present your results

# Attention to all projects!

- You should present the results of *your* research, i.e., you should draw *your* own conclusions
- You can and you should use various sources of information but only for your analysis, not to copy somebody's else conclusions
- It's important to cite the sources of information – what you used and for which purpose
- We will exchange our new knowledge through presentations and related feedback

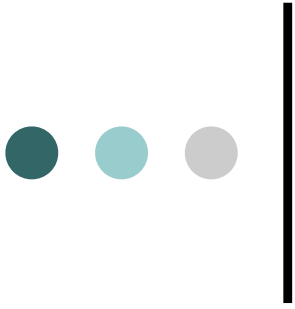*Our main interaction is in a form of a seminar*

# Different sources of information

○ Books in reputable publishers, such as Springer, Academic Press, etc.

○ For most recent results, publications from certain databases:

- DBLP – computer science bibliography

- Google Scholar – bibliographic database

- IEEE Xplore – digital library to IEEE letters, magazines, proceedings, ...

- Scopus – database of peer-reviewed literature

- Web of Science (Web of Knowledge) – citation indexing service

...

*Attention: Not any source online is verified*

*Don't trust so much to blogs!*

# Thank you!