EuroSDR

European Spatial Data Research

AI at NMCAs in Europe

EuroSDR

www.eurosdr.net

Outline

1. Highlights of EuroSDR/EuroGeographics Joint Virtual **Workshop** Artificial Intelligence (AI) for National Mapping/Cadastral Agencies in Europe

II. EuroSDR Machine Learning/Deep Learning Projects (ML/DL) **Survey** 2021

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Bundesamt für Landestopografie swisstopo
Office fédéral de topographie swisstopo
Federal Office of Topography swisstopo

EuroGeographics/EuroSDR Workshop AI for NMCAs

EuroSDR

EuroSDR

eurogeographics

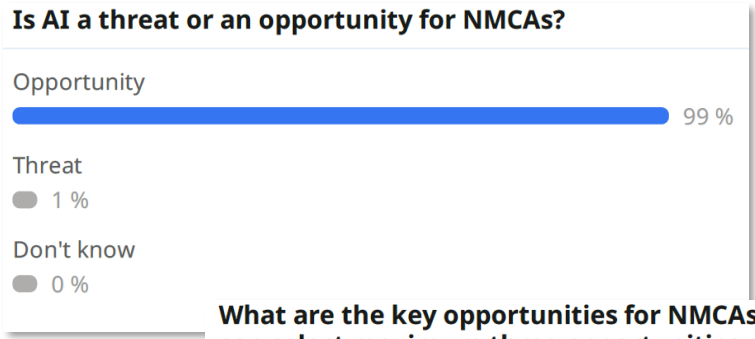
EuroGeographics/EuroSDR Workshop for NMCAs

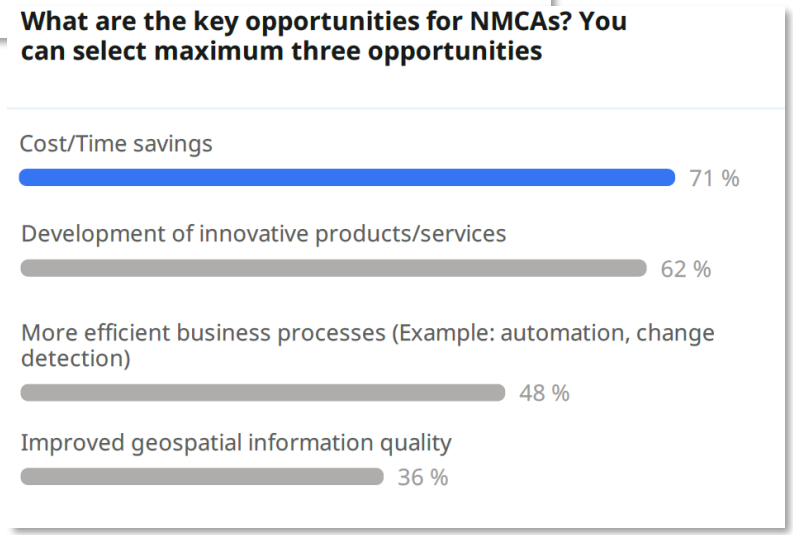
Workshop Aims and objectives

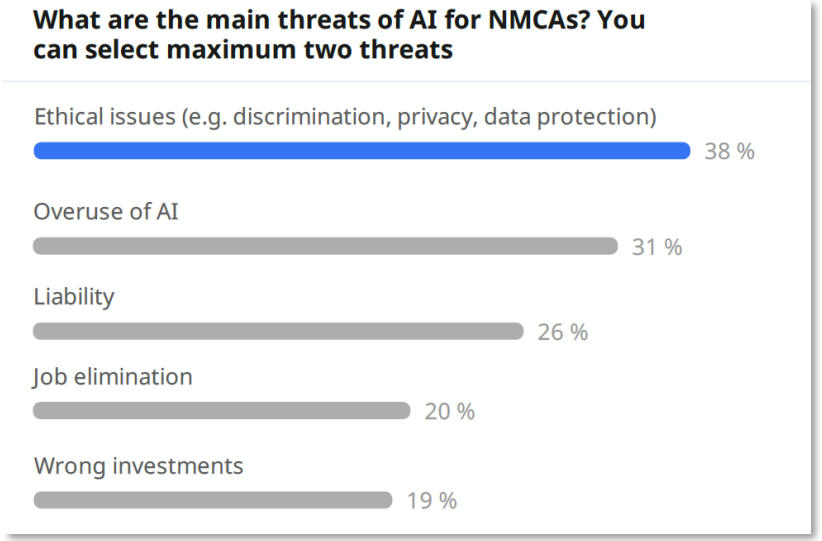
- 3-4 February 2021
- Raising **awareness** and **understanding** of **AI** within the context of NMCAs
- Helping to appreciate the **impact**, **benefits, limitations** and **effects** of AI on the business processes of European NMCAs.
- What are the **potentials** of AI?
- What are the current technology **trends** in AI for geospatial data?
- What does this **mean** for National Mapping, Cadastral and Land Registration Authorities (NMCAs) across Europe?
- What are the **potential risks**?

A diverse audience of 250 participants

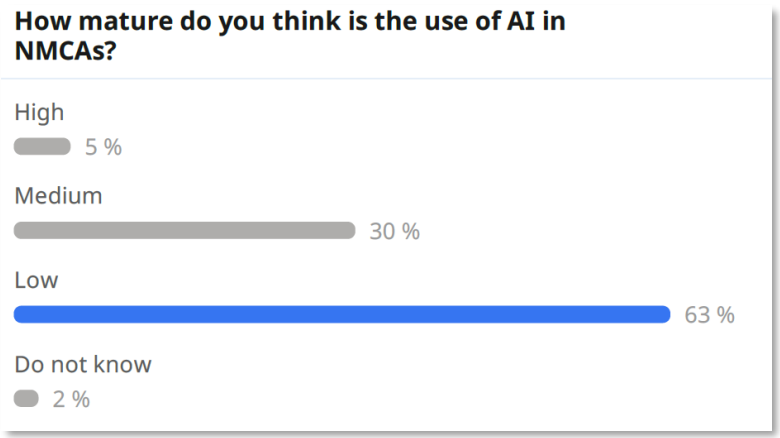
AI in NMCAs – Threat or Opportunity?

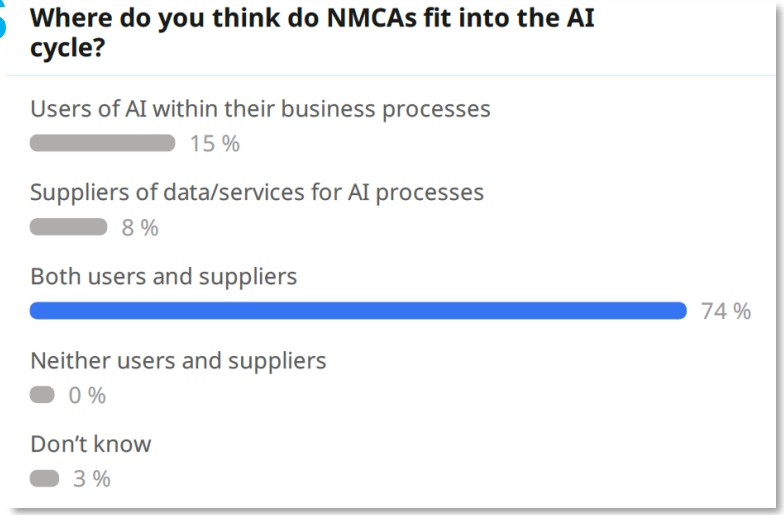


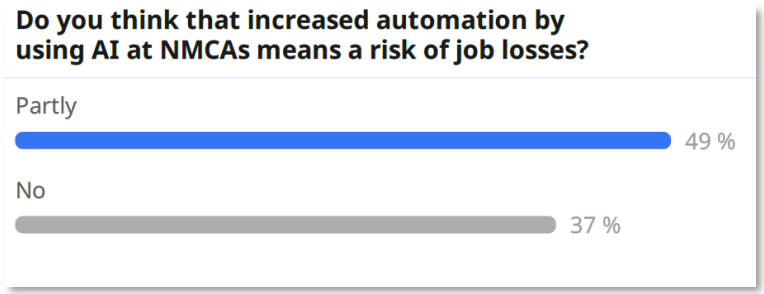


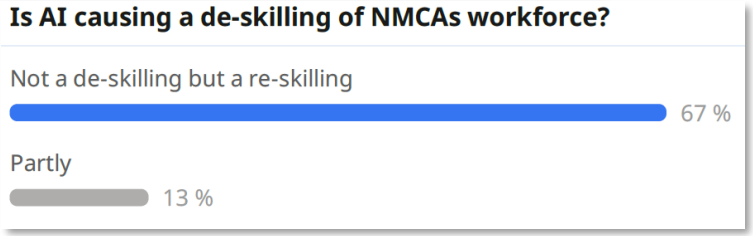


Status of AI in NMCAs

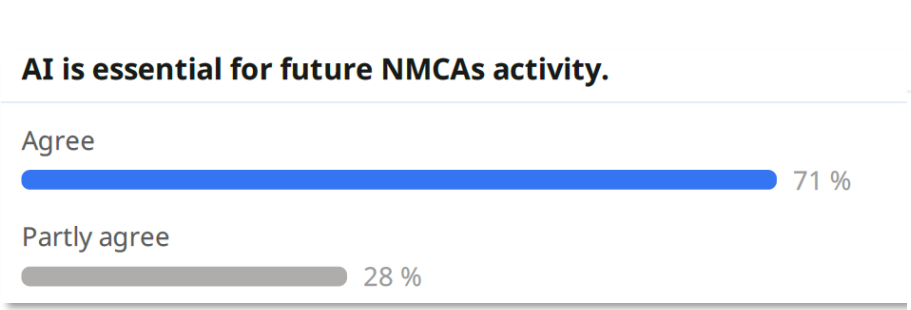


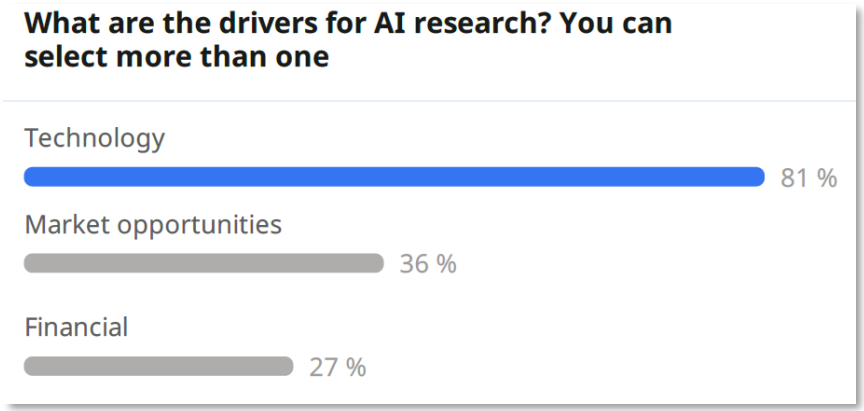


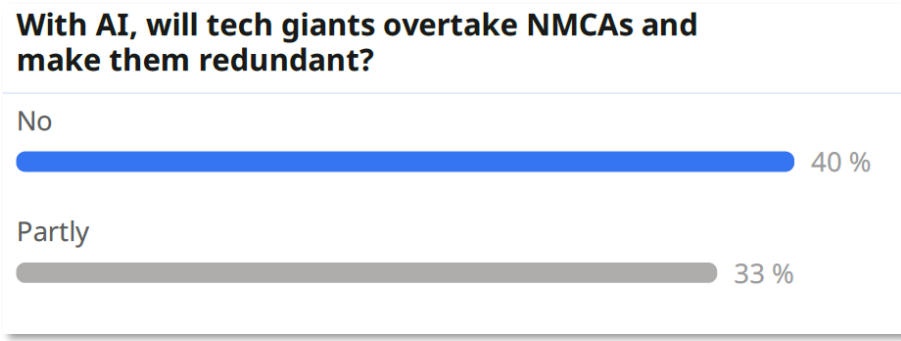




Future of AI for NMCAs? Next steps







Wrap Up Day 1

- AI is an **opportunity** for NMCAs (e.g. cost/time savings, more efficient business processes)
- **Low AI-Maturity** at NMCAs -> most applications are in stage of Proof-of-Concept
- AI is **not** considered **a threat** for NMCAs – some concerns about ethics and overuse
- Numerous AI-policy initiatives at EU-level + national level
- Do not expect miracles and radical changes of AI-use

Wrap Up Day 2

- **Ethical** concerns (being addressed through charters elaborated at international level)
- **Rights in digital world must be the same as rights in real world**
- **Measures** to prevent identification of a person's location must be taken.
- **Risk** of discrimination through machine learning algorithms / bias in data collection
- AI as a tool, not as a magic/silver bullet
- Some remaining issues: importance of post-processing, Training data is an issue, data noise
- Opportunities, threats, ethics, …, It is all a matter of balance

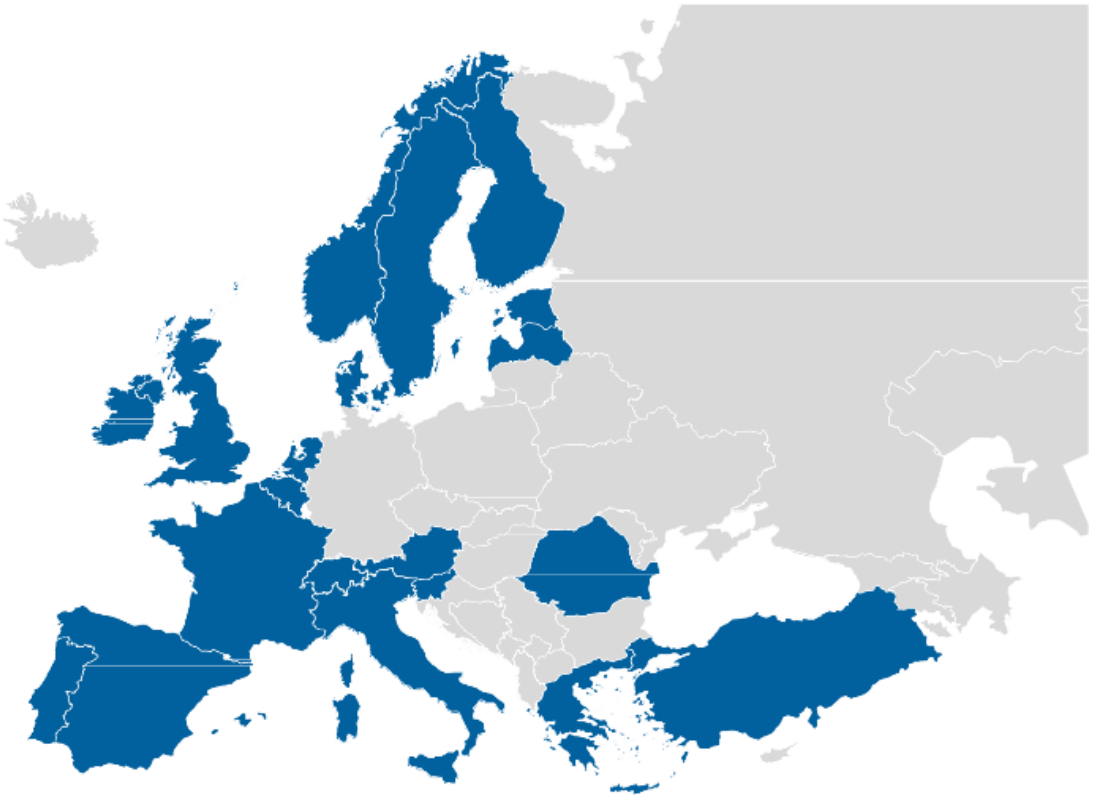
EuroSDR Machine Learning/Deep Learning (ML/DL) Projects Survey

EuroSDR Machine Learning/Deep Learning (ML/DL) Projects Survey

- Follow up action of the successful Joint Virtual EuroSDR/ EuroGeographics Workshop on “Artificial Intelligence for NMCAs”
- Repetition the EuroSDR survey on Machine Learning / Deep Learning conducted in 2018
- Open for all NMCAs across Europe interested in topic of AI
- Valuable support of swisstopo
- Survey consisted of 18 questions (closed and open)
- Open from 15.03.2021 to 15.06.2021

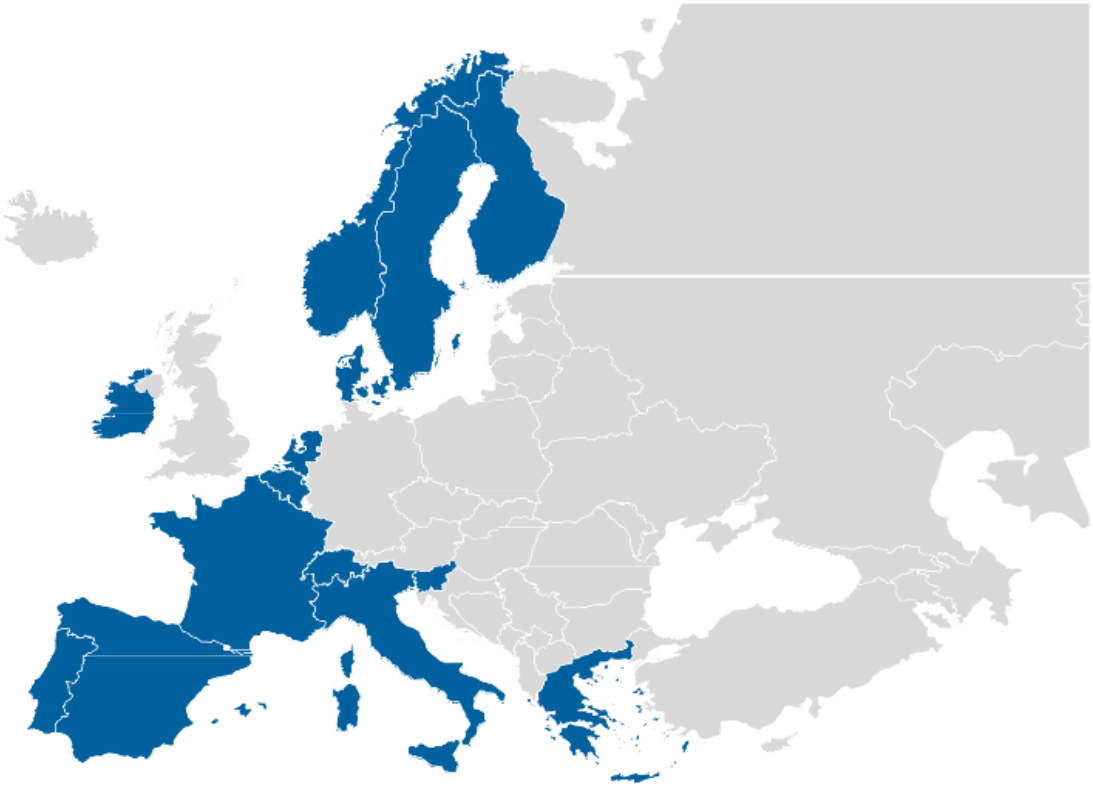
Survey response

38 Mapping Agencies
from 20 countries



Notified ML/DL Projects

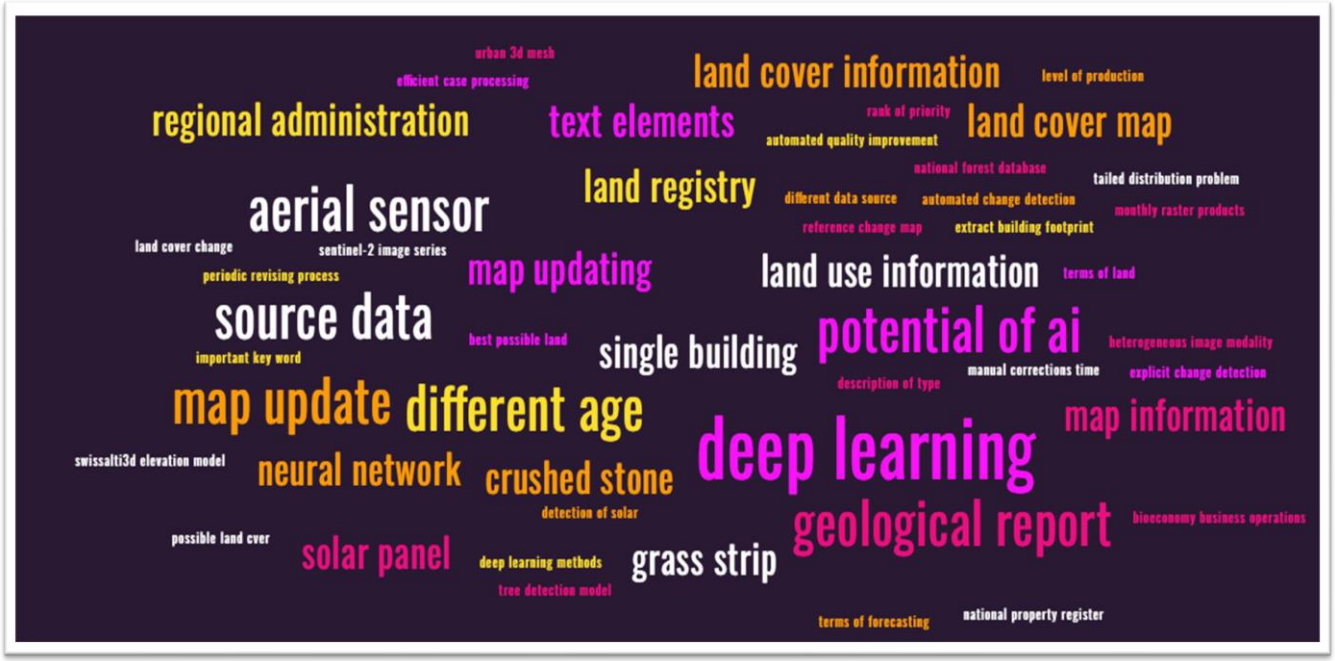
- 32 projects notified
- 16 organisations
- 14 countries



What are the main objectives that the project aims to achieve?

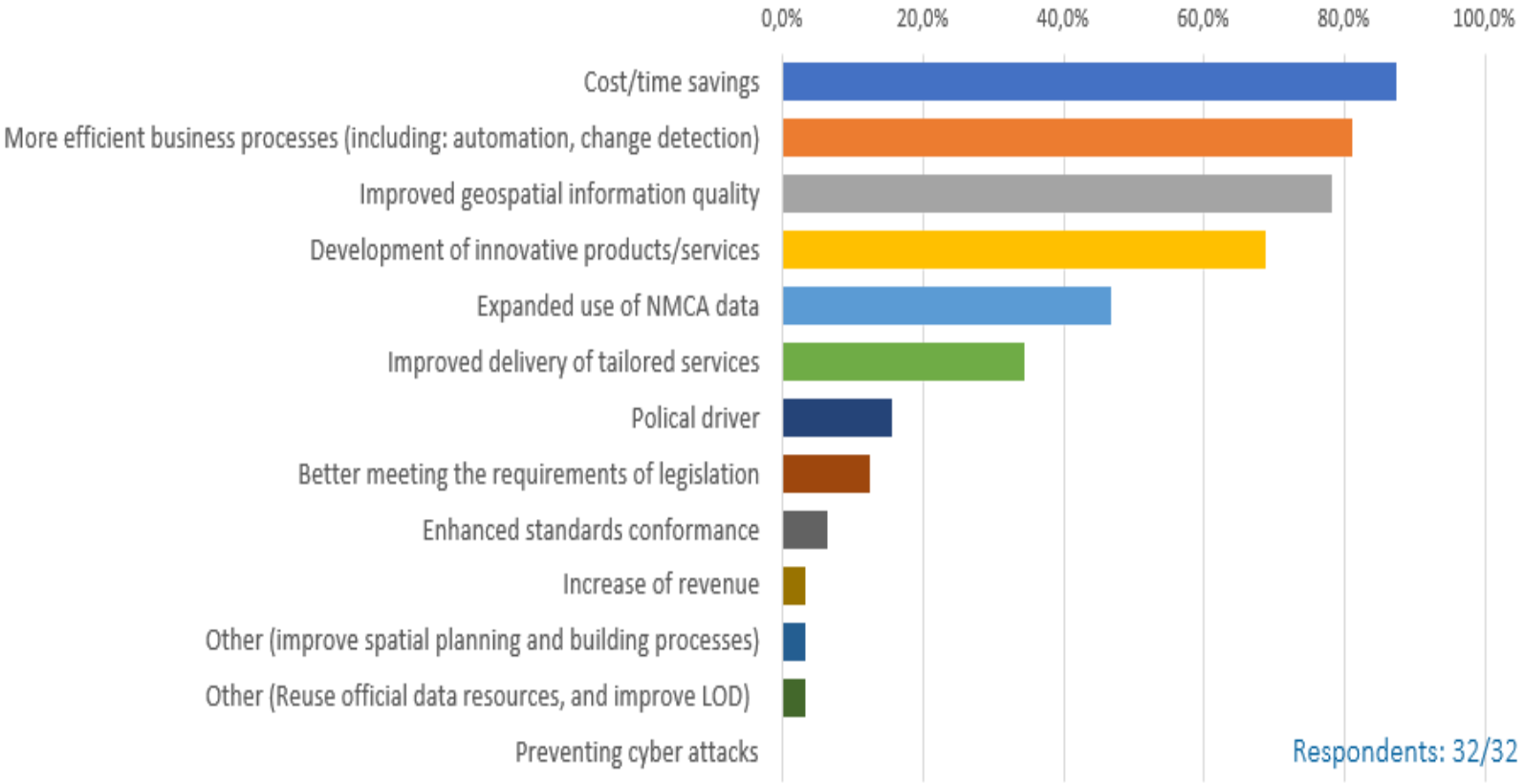
Single-word cloud highlighting the frequency and relevance of objectives

What are the main objectives that the project aims to achieve?

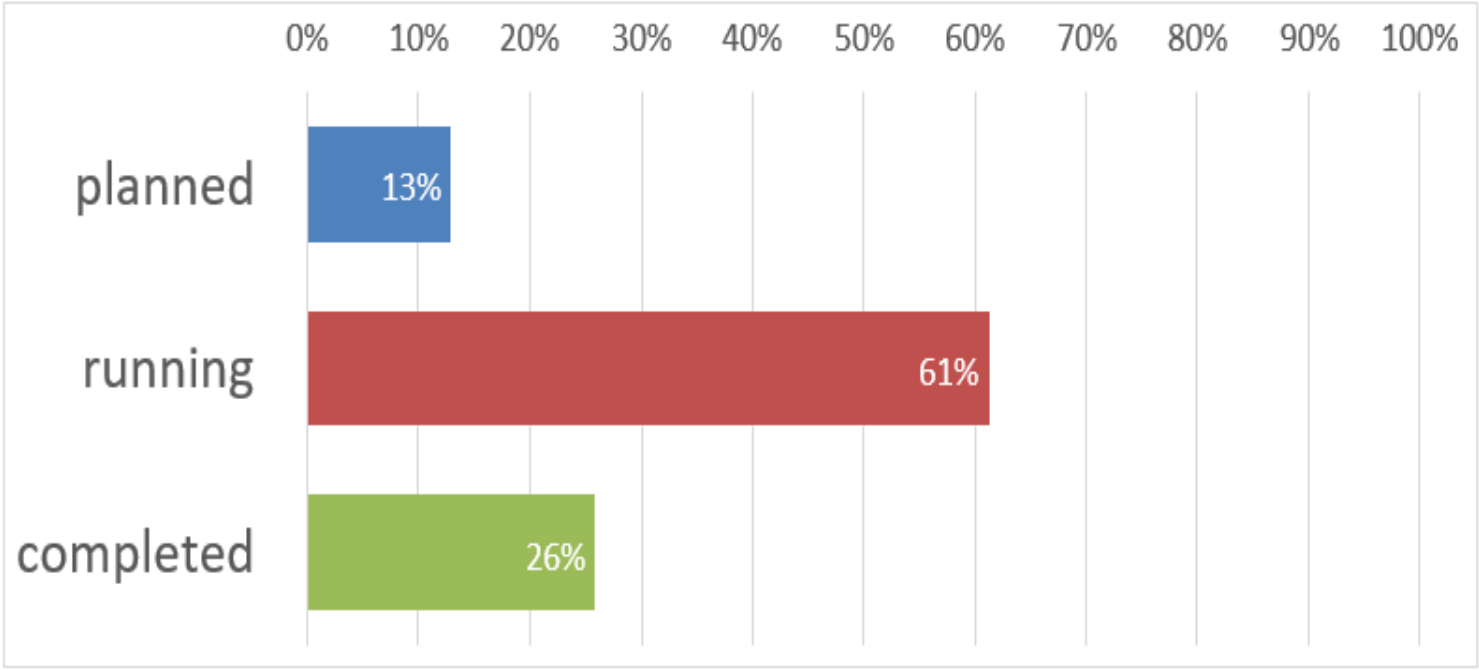


Deep Learning based **collocating-words cloud** highlighting the frequency and relevance of objectives

Purposes for being interested ML/DL?

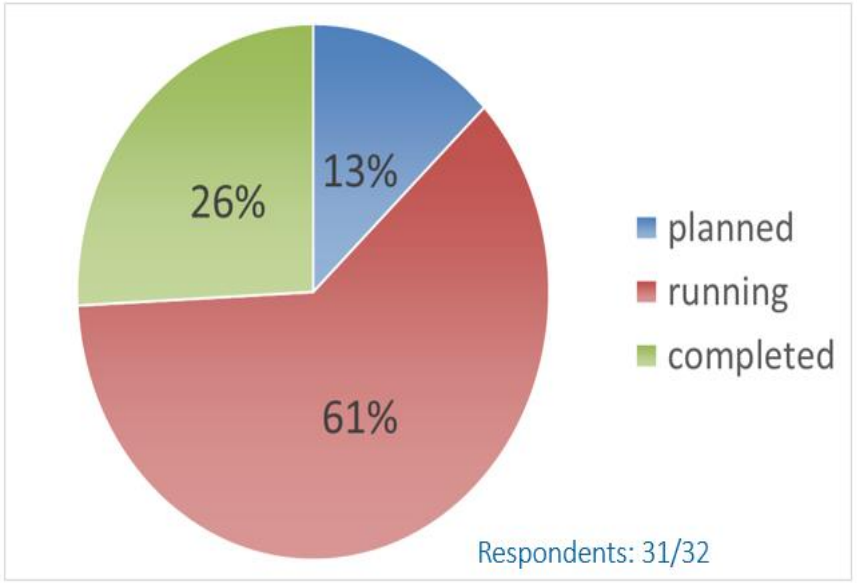


Project status

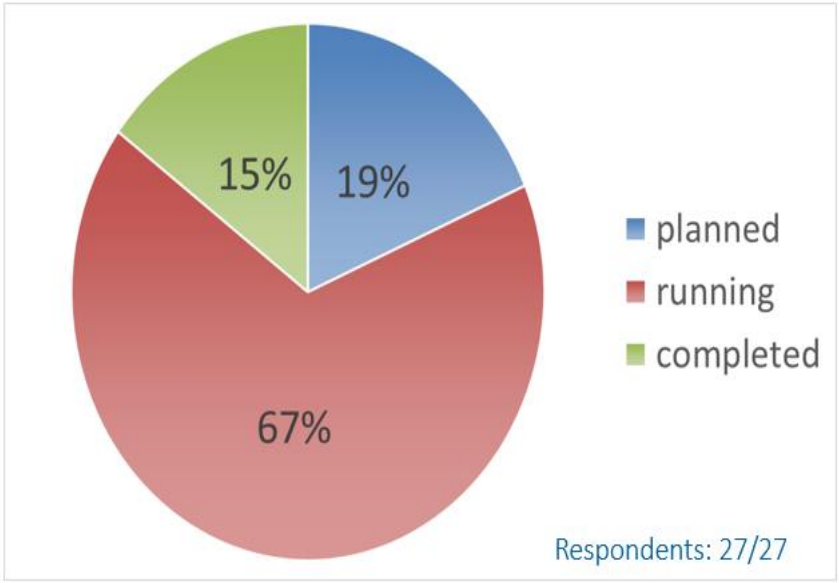


Respondents: 31/32

Project status

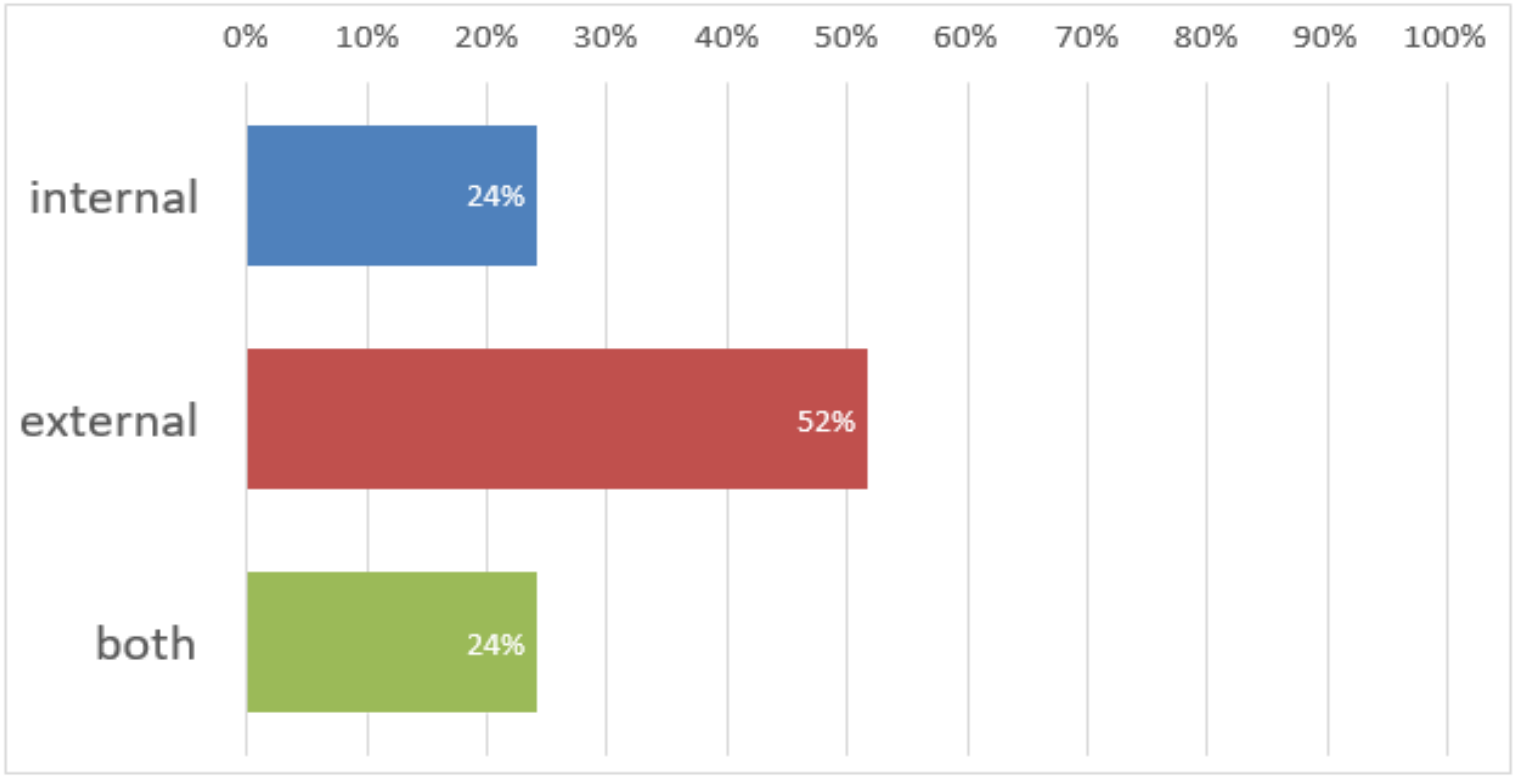


2021



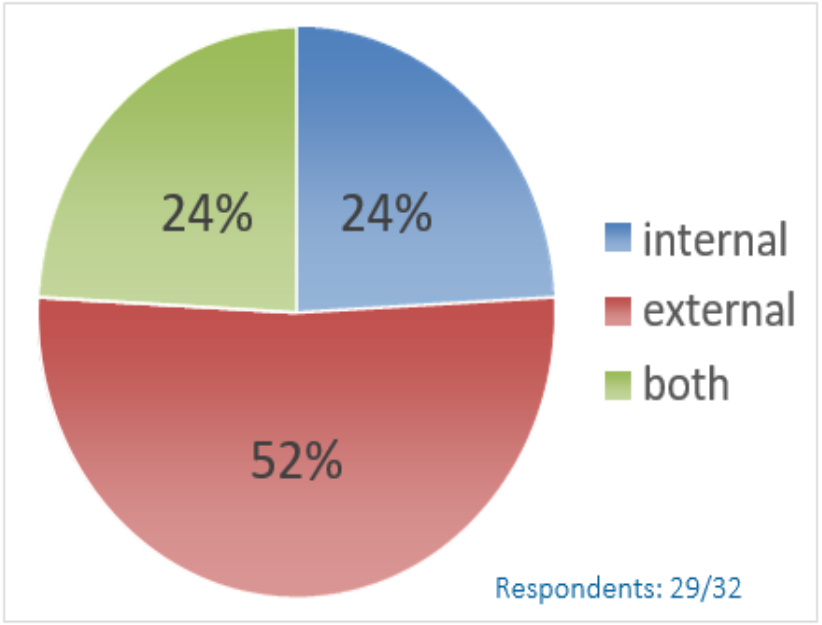
2018

Project contractor / research entity

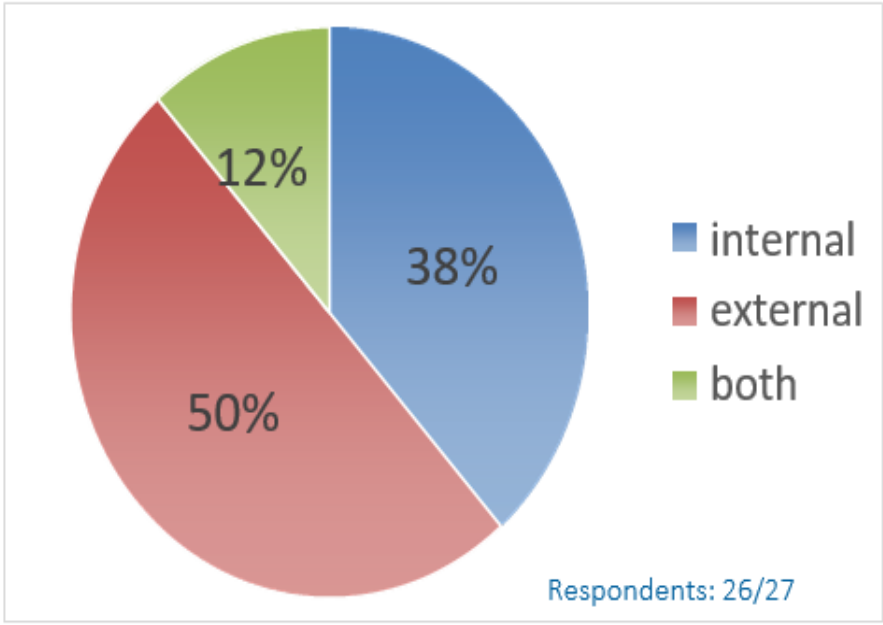


Respondents: 29/32

Project contractor / research entity

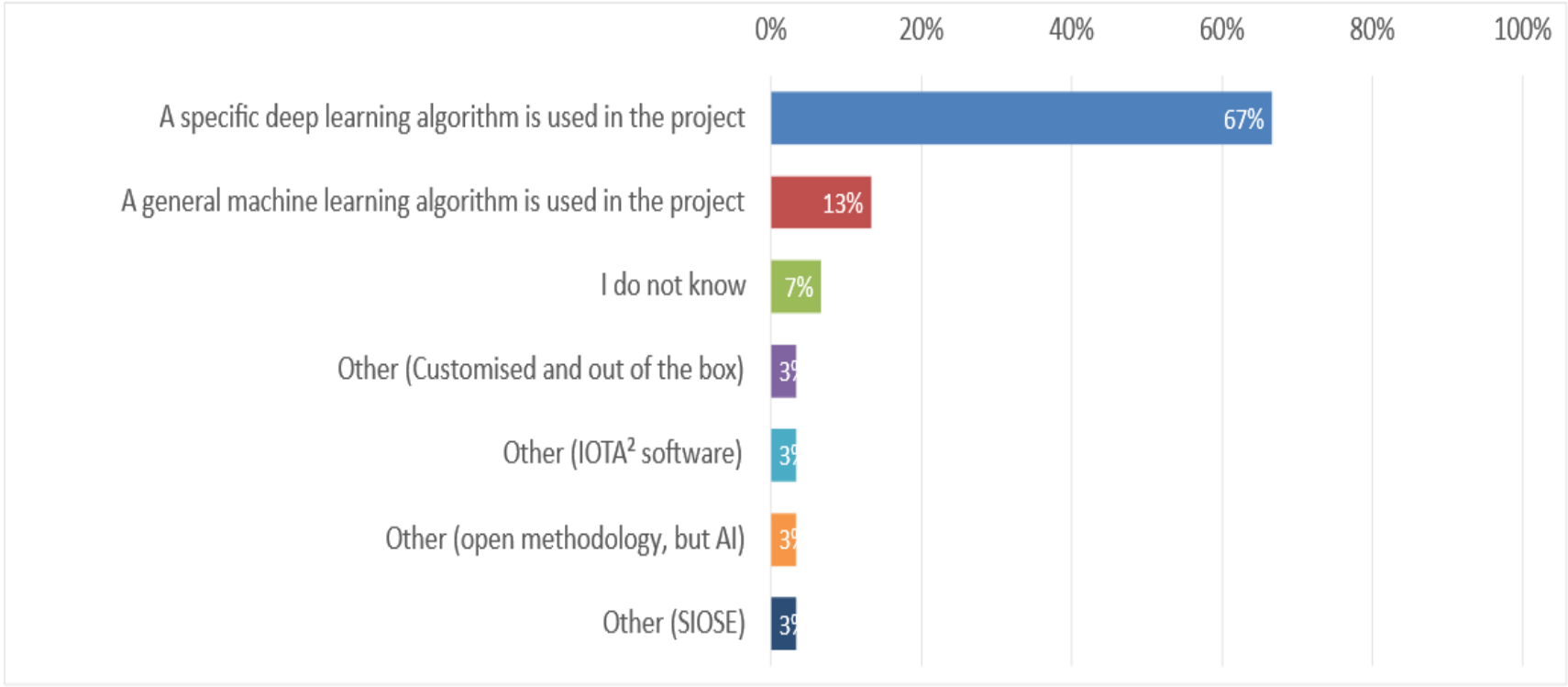


2021



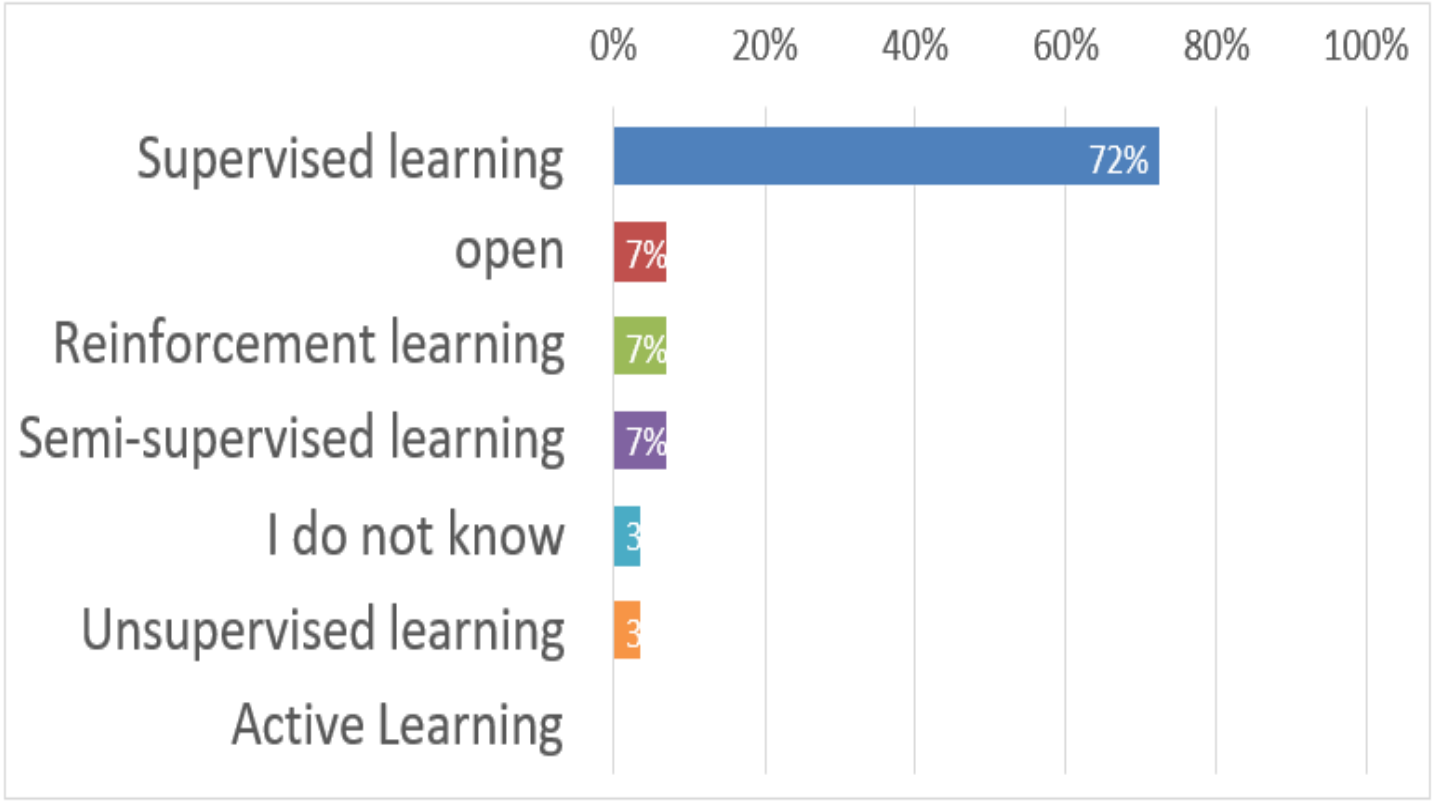
2018

Type of algorithm used in the project



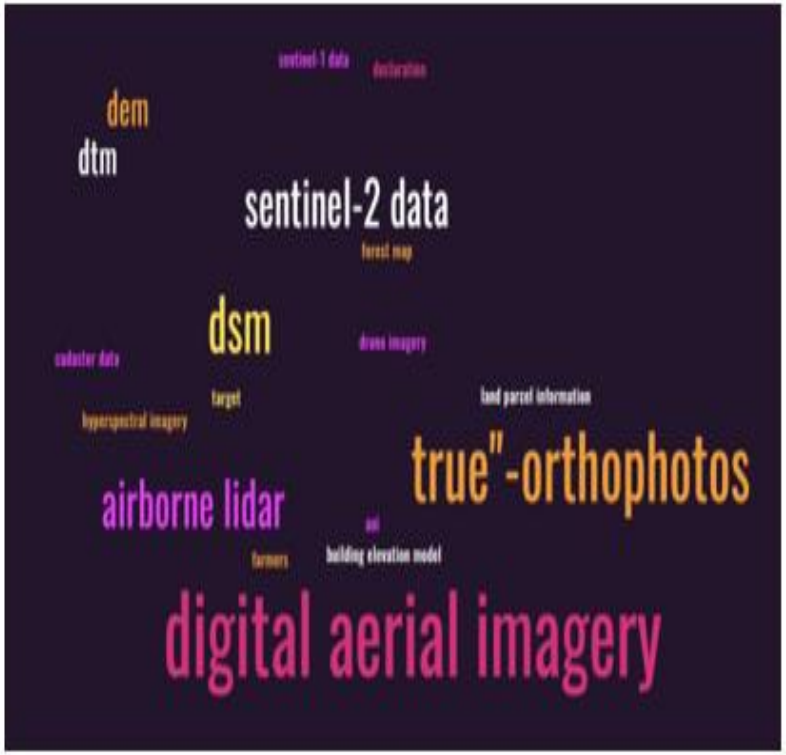
Respondents: 30/32

Type of Machine Learning algorithm used in project

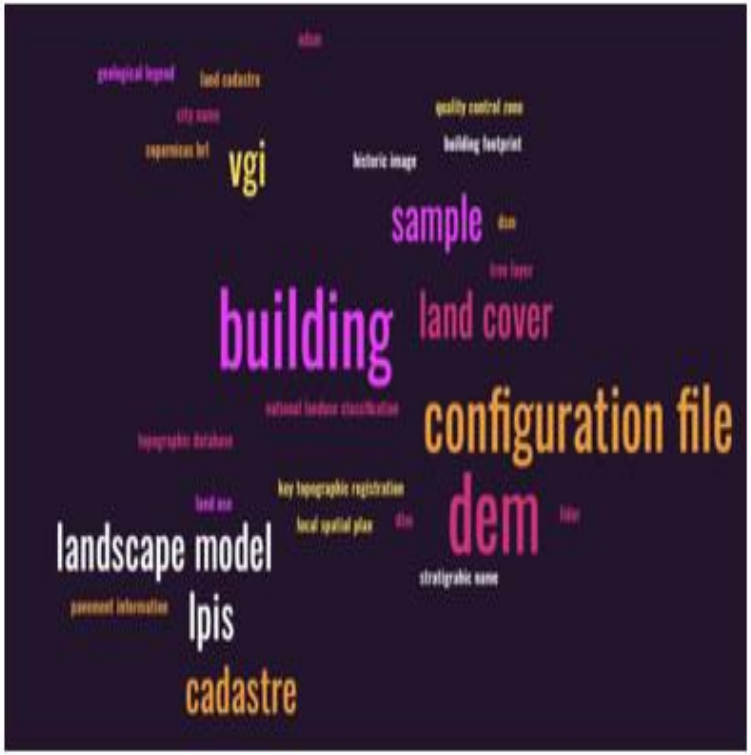


Respondents: 29/32

Input data set(s) for the project

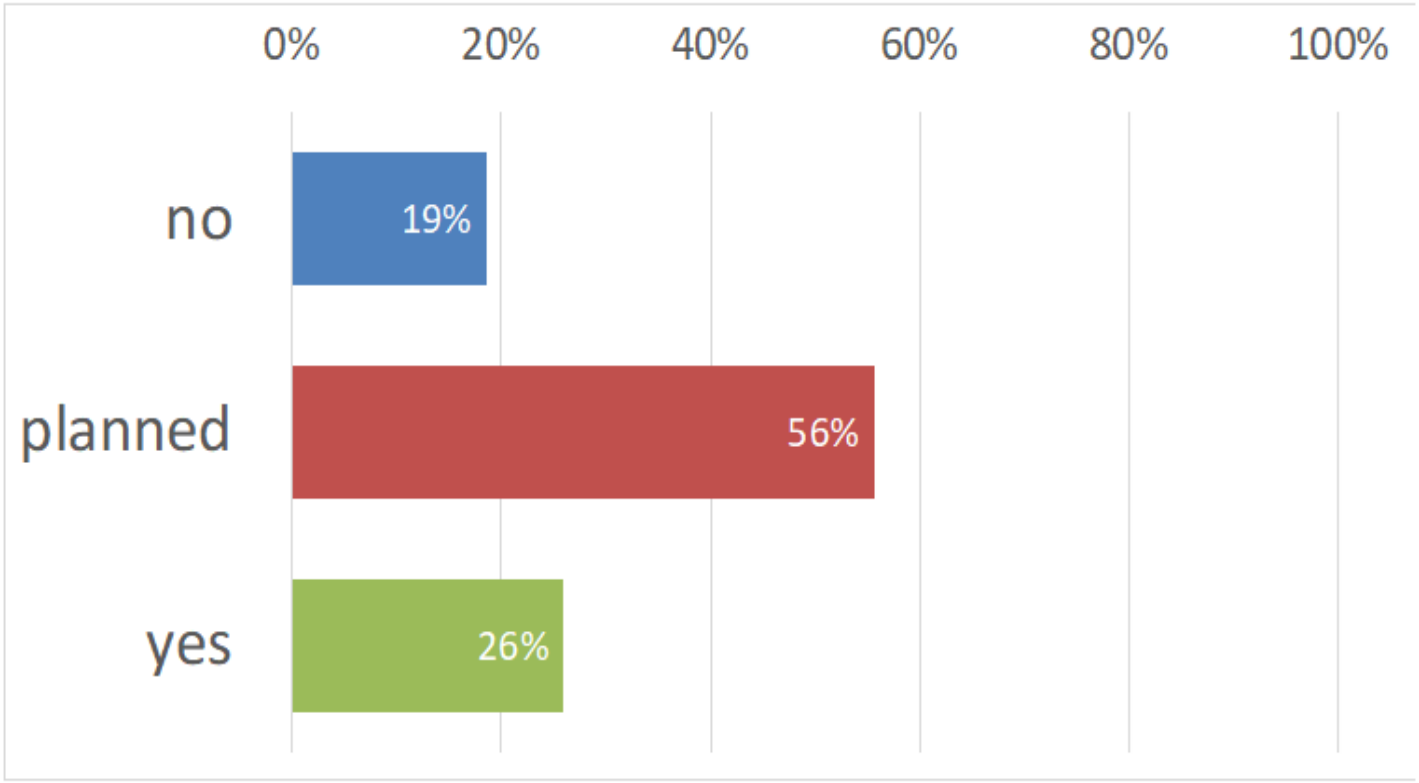


Geodata

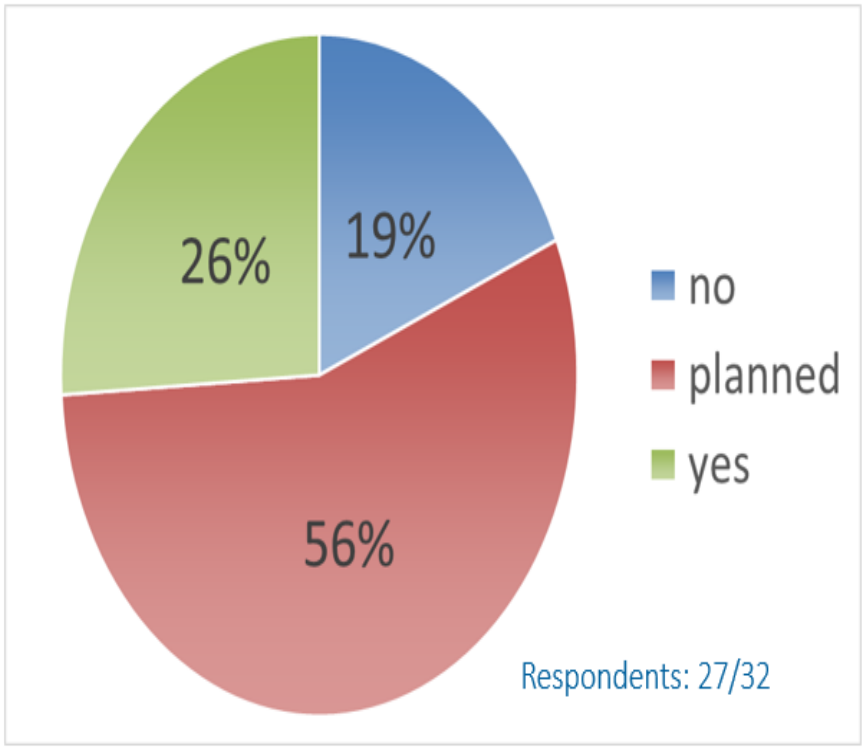


Auxiliary data

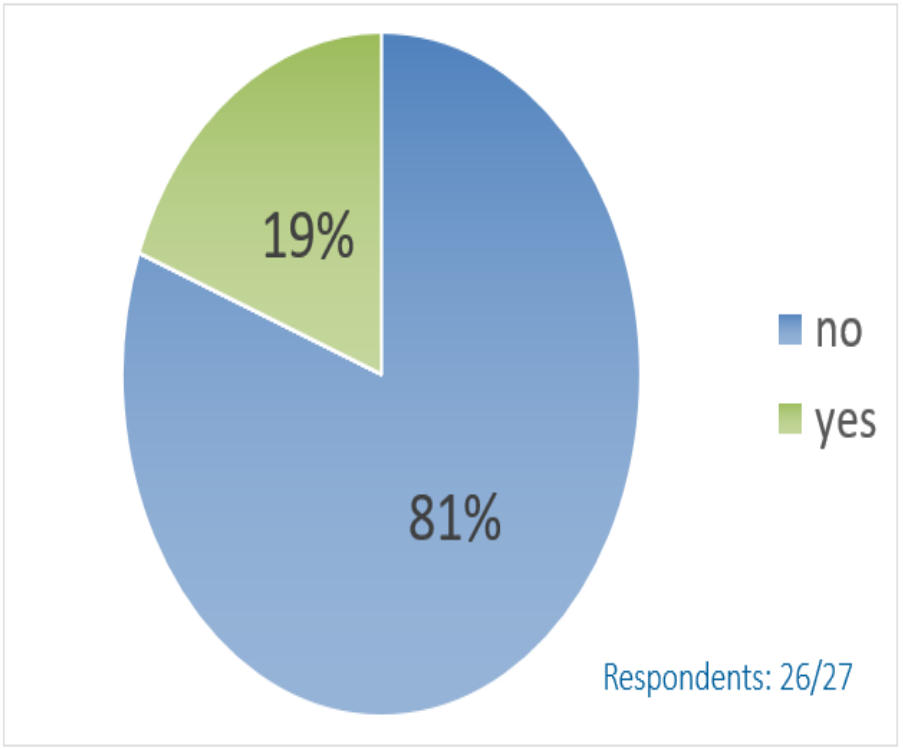
Implementation in production-line



Implementation in production-line



2021



2018

Main Findings

- annual land cover map provides insufficient thematic accuracy
- **post-classification analysis based on expert-knowledge is needed**
- some problems with smaller buildings
- optimization of resources in time and responsiveness to end users
- **post control quality with semi-manual process is required**
- huge effort on labelling
- training data needs to be improved
- one model is not sufficient to capture all features
- with limited training good accuracies have been achieved
- **customized post-processing needs to be incorporated**
- it is still hard to figure what the model exactly learns in terms of weights and biases associated with the layers
- discrepancy between historical databases and relevant training data
- need to integrate in larger pipelines w/ post-processing
- importance of frequent feedback from thematic experts"
- a good use of public investments to improve citizen's health
- **as expected, we cannot and should not replace human annotators**
- already reached 88% accuracy without much hyper parameter tuning
- hard to exclude false positives
- cost saving in the creation of detailed database, in comparison with traditional approaches of photointerpretation
- **automatic results needs and human revision**

Respondents: 29/32

Conclusions

AI is new and yes, it may turn out to be valuable

AI-use at NMCAs: Still in phase of infancy

AI as a tool, not as a magic/silver bullet (Hype)

Wise not to expect miracles and radical changes

Need to think carefully about how to use AI

Time needed to become mainstream in NMCAs

If you ‘torture’ AI long enough it will confess to anything

Opportunities, Threats, Ethics …, It is all a matter of balance

Some remaining issues: importance of post-processing,

Training data is an issue

- **More information?**
- http://www.eurosdr.net
- https://twitter.com/eurosdr