European Research Council
Established by the European Commission

European Commission

ERC frontier research contribution to a Europe fit for the digital age

The European Research Council (ERC) follows a strictly bottom-up approach to funding research proposals, with excellence as the sole criterion for selection. The research that ERC grantees pursue, free of any thematic objectives, generates results that address a wide range of issues with significant socioeconomic, environmental and policy relevance. As a result, this rich and diverse portfolio of frontier research generates new knowledge and proposes concrete solutions for addressing some of the most pressing policy priorities of the European Commission. This is the case of the over 700 projects funded by the ERC, worth more than €1 billion, in the Horizon 2020 (H2020) Framework Programme (2014–2020) that are relevant for 'Europe fit for the digital age'.

Data as of December 2021

ERC frontier research contribution to a Europe fit for the digital age

This fact sheet provides an overview of the projects relevant for the selected areas of the Europe fit for the digital age. The projects were funded under the Starting Grant (StG), Consolidator Grant (CoG), Advanced Grant (AdG) and Synergy Grant (SyG) schemes launched in the H2020 Framework Programme (2014–2020)*

Areas of interest for a Europe fit for the digital age

- Foundational developments for the digital age
- Artificial intelligence
- Quantum technologies
- Cryptography and security
- Advances in information and communication technologies
- Societal data science
- Digital health
- Other digital age-related research

757 ERC-funded projects, worth **€1466 million**

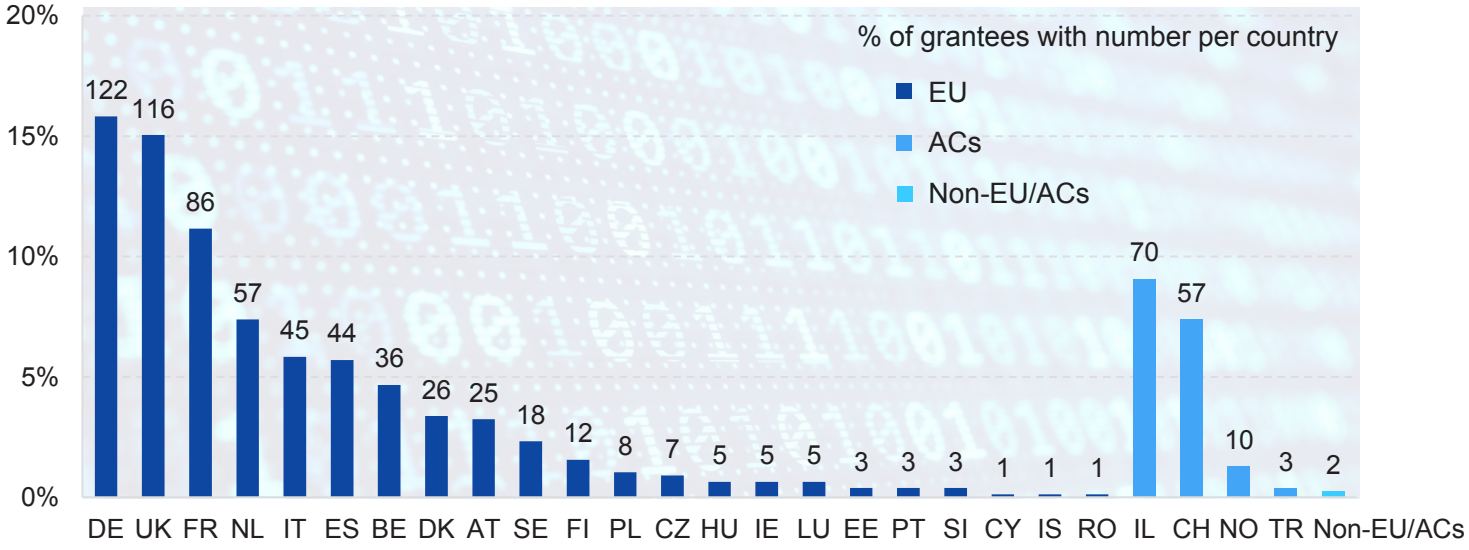
Physical sciences and engineering
632 projects, €1226M

Life sciences
32 projects, €75M

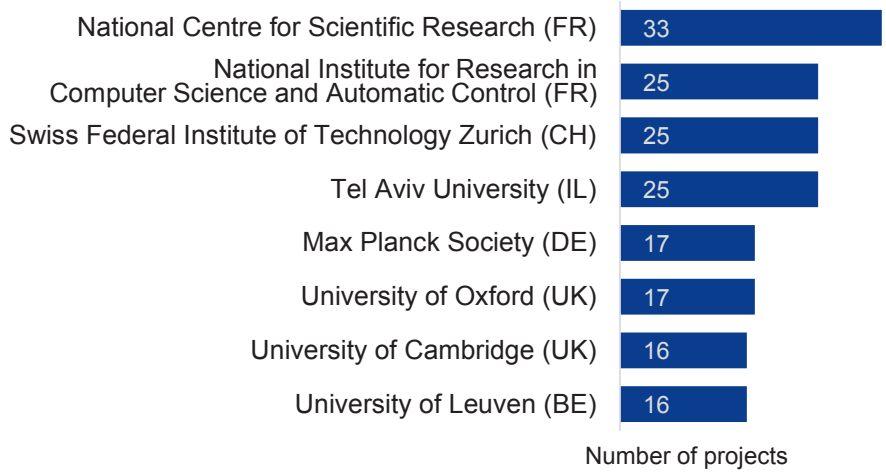
Social sciences and humanities
93 projects, €165M

Distribution of ERC-funded projects in Horizon 2020

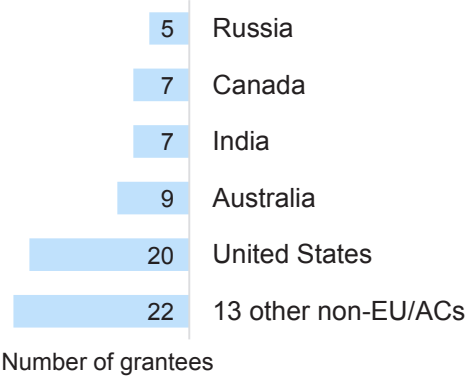
771 grantees lead 759 projects and are based in 22 EU Member States, 4 Associated Countries (ACs) and 2 non-EU/ACs



Host institutions with ≥16 funded projects

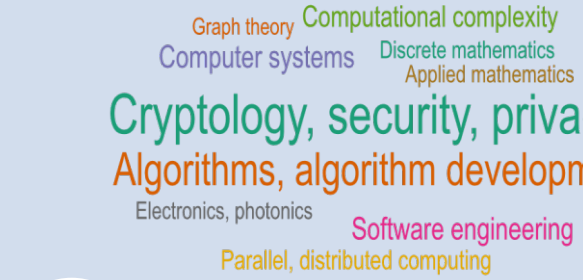


Country of origin of grantees other than EU or ACs (≤4 grouped together)



*Data as of December 2021

The scientific landscape of frontier research projects contributing to the selected Europe fit for the digital age areas

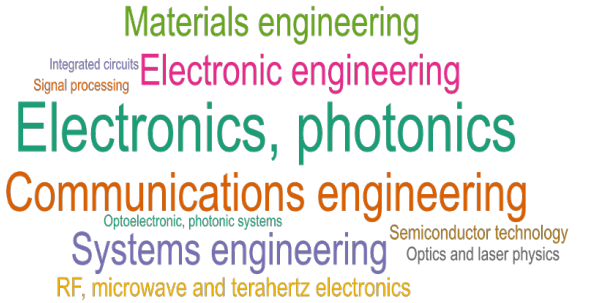


Foundational developments for the digital age

118 projects, €221 million

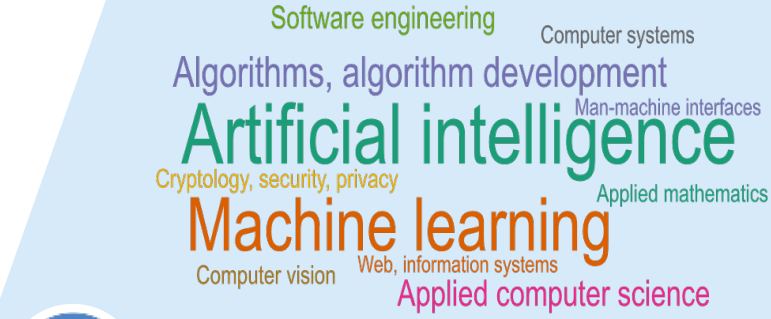
Societal data science

64 projects, €113 million



Advances in information and communication technologies

43 projects, €87 million

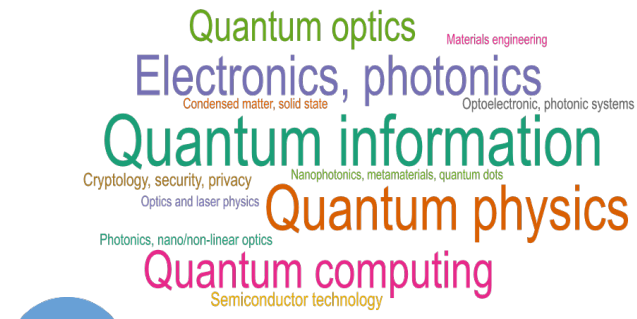


Artificial intelligence

301 projects, €562 million

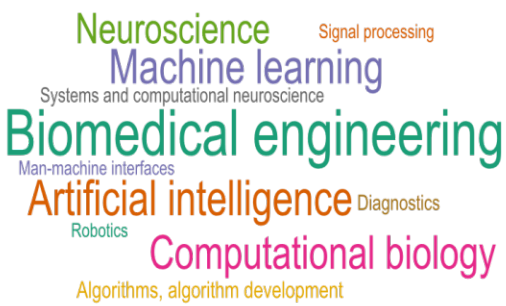
Cryptography and security

103 projects, €185 million



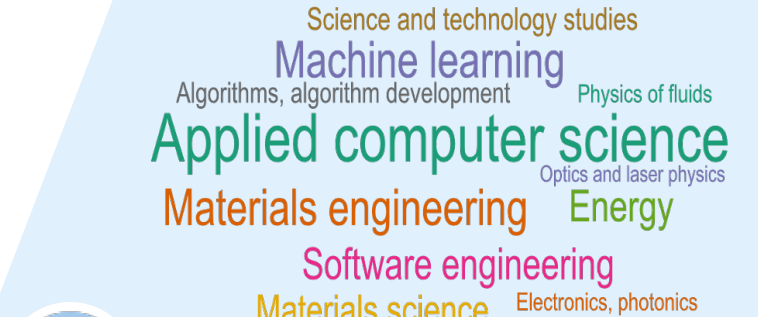
Quantum technologies

98 projects, €199 million



Digital health

105 projects, €213 million



Other digital age-related research

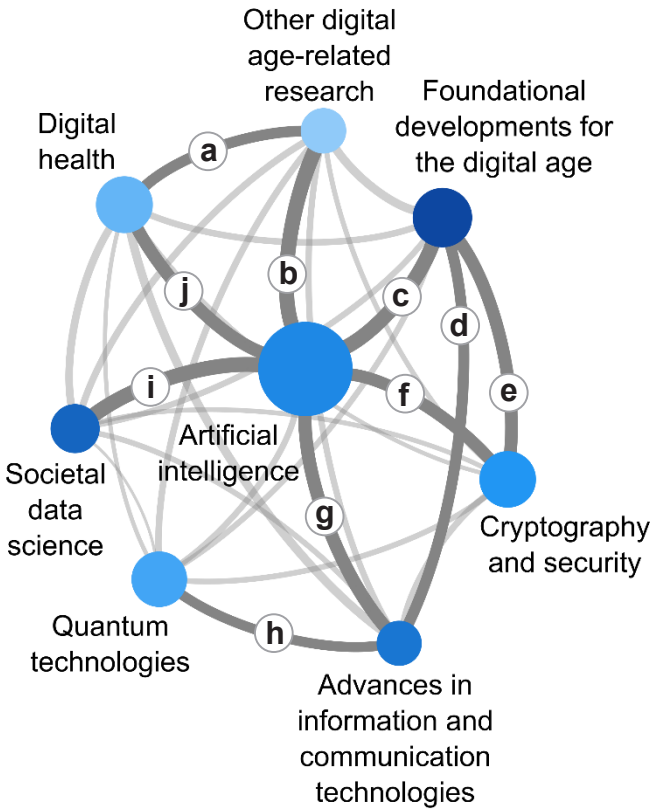
45 projects, €110 million

The word clouds represent the most prevalent scientific fields in the pool of ERC projects identified as relevant for each of the selected areas of a Europe fit for the digital age. The total number of projects under each area as well as the budget are indicated.
15% of the 757 projects contribute to two or more of these areas.

Scientific synergies and methodological developments in the selected Europe fit for the digital age areas

Scientific synergies among Europe fit for the digital age areas

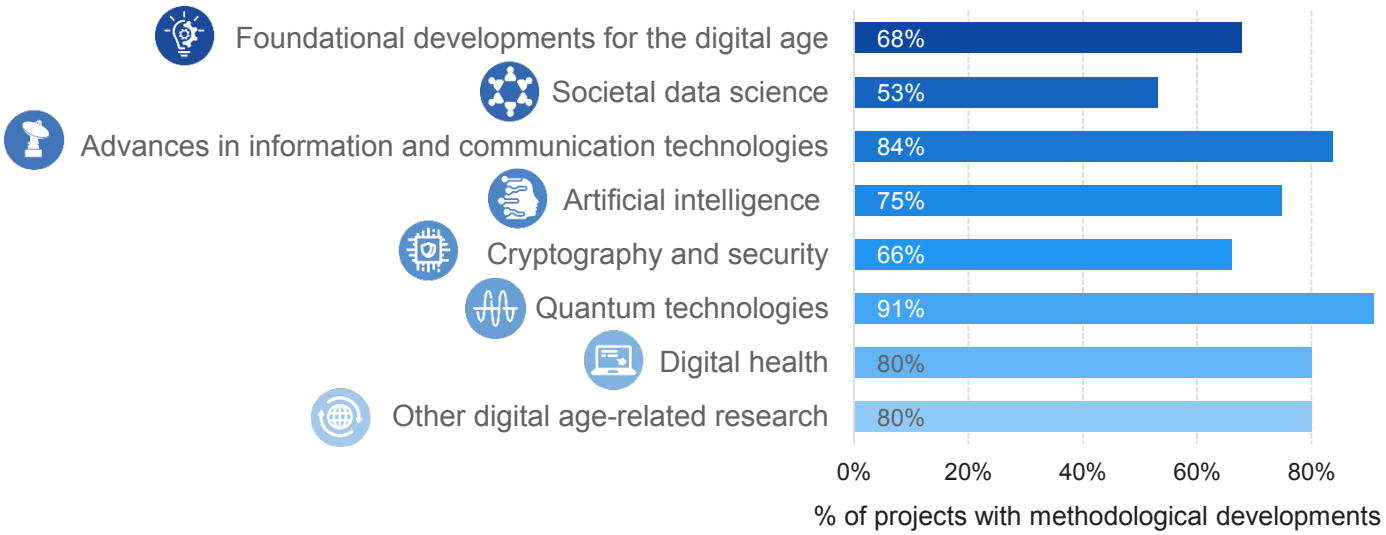
The nodes represent the selected areas of Europe fit for the digital age and their size is proportional to the number of projects. These areas are interconnected and the strength of this connection is represented by the thickness of the arc, which is proportional to the number of shared scientific fields. The most representative scientific fields for the main connections, highlighted with letters, are listed.



- **a** Applied computer science; Software engineering; Materials engineering
- **b** Applied computer science; Materials engineering; Software engineering; Science and technology studies
- **c** Cryptology, security, privacy; Computer systems; Software engineering; Applied mathematics; Electronics, photonics
- **d** Electronics, photonics; Systems engineering; Communications engineering; Electronic engineering; Materials engineering
- **e** Cryptology, security, privacy; Computer systems; Software engineering
- **f** Cryptology, security, privacy; Computer systems; Software engineering; Web, information systems
- **g** Systems engineering; Electronics, photonics; Communications engineering; Electronic engineering; Materials engineering
- **h** Electronics, photonics; Materials engineering; Optics and laser physics
- **i** Artificial intelligence; Applied computer science; Political science; Science and technology studies; Web, information systems
- **j** Artificial intelligence; Biomedical engineering; Diagnostics; Control engineering

Methodological developments in projects contributing to the selected Europe fit for the digital age areas

The main methodological development in the projects relevant for the selected Europe fit for the digital age areas is in the field of *Computational modelling, simulations* with Artificial Intelligence and complex systems being the focus. Other prominent methodological developments are *Theoretical, mathematical methods* with a focus on digital methods and *Validation, demonstration, prototyping* with a focus on digital developments and applications.



Examples of ERC-funded projects contributing to the selected Europe fit for the digital age areas

COMPUTED drew on behavioural models from psychology to develop algorithms better suited to design user interfaces, therewith improving human-computer interaction.

Using the latest techniques in Big Data, Magdalena Wojcieszak's EXPO project analyses how exposing people to dissimilar views in the media can be both risky and beneficial.

BNYQ is set to revolutionize the analogue-to-digital conversion systems with a crucial impact in day-to-day applications, including ultrasound imaging and radar detection.

Tamed Cancer is a pioneering project aiming at improving personalized therapies by developing robust algorithms. This breakthrough concept could revitalize cancer treatment by calculating optimal drug dosages.

INTERACT is developing new interactive learning algorithms to address sentences in text of speech that is often complex and compositional.

CIRCUS takes a comprehensive approach to cybersecurity. The team led by Karthik Bhargavan was able to improve the Transport Layer Security protocol using downgrade cyber attacks simulations.

Examples of ERC-funded projects contributing to the selected Europe fit for the digital age areas

SOPHIA aims to establish the scientific foundation for securing software against physical attacks, and discovered two new security vulnerabilities in computer processors, named Meltdown and Spectre, allowing unauthorised external access to personal data.

Grenadyn demonstrates that assemblies of imperfect, dynamical nanodevices can self-learn through physical principles, like biological neurons and synapses do. The team led by Julie Grollier will produce a chip and achieve state-of-the-art recognition rates on AI image benchmarks

SPRINT made substantial advancements in surface polaritronics and Terahertz Detection with the ultimate goal to develop a new generation of passive mode-locked THz photonic laser resonators through the combination of quantum cascade laser technology with graphene

EAR proposes models linking sound to disease diagnosis. The team led by Cecilia Mascolo launched an app to identify symptoms through voices and coughs to explore automatic diagnosis of COVID-19

EmbodiedTech demonstrated that the human brain can repurpose neurons to represent and control artificial limbs with the ultimate goal of finding the necessary conditions for the brain to recognise artificial limbs following an amputation.

CALC establishes a computer-assisted framework for linguistics analysis, focussing on how languages convey emotion and its meaning across cultures.