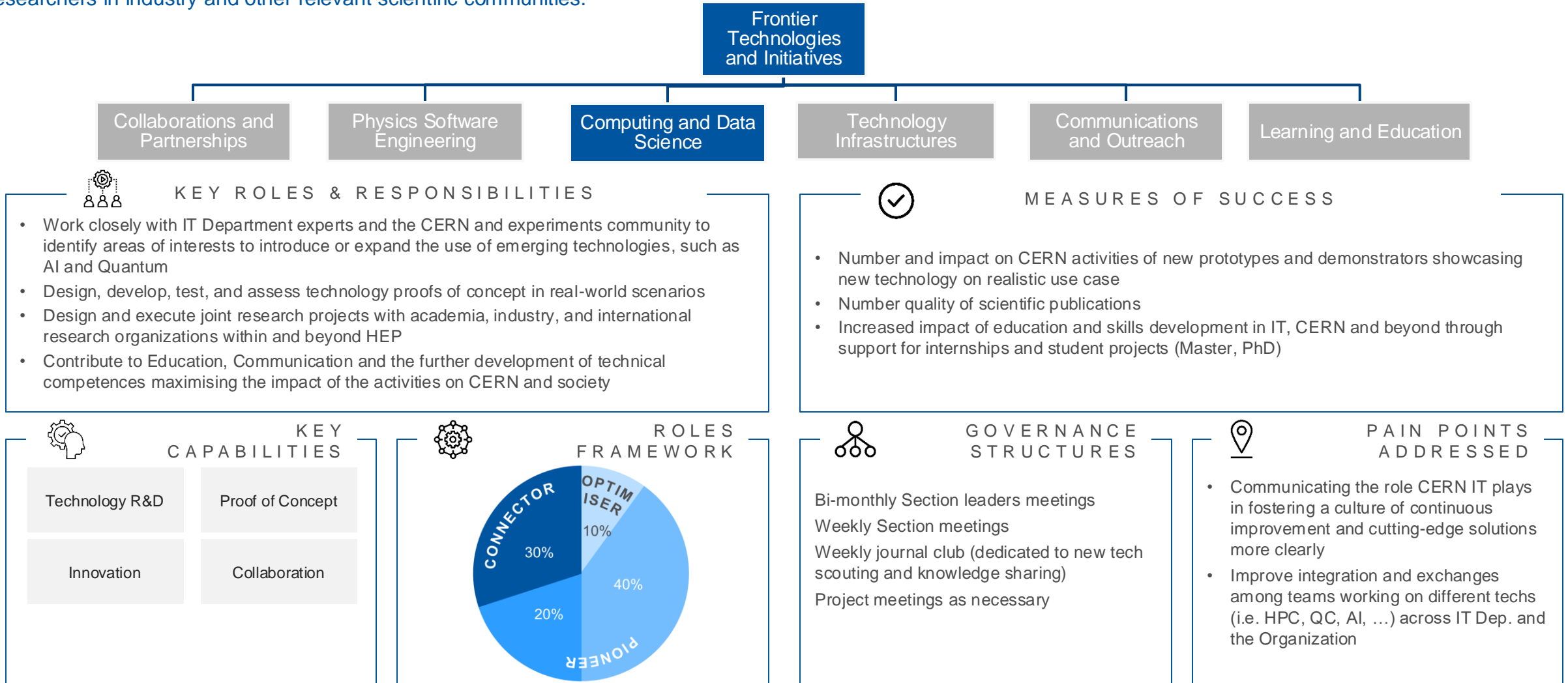# Computing and Data Science

IT-FTI-CDS

Sofia Vallecorsa

Functional overview

The Computing and Data Science Section will study the impact of cutting-edge technologies like Quantum Computing and Artificial Intelligence on the development of future computing models for fundamental scientific research by developing proof of concepts and co-development activities with IT Dep. experts, CERN and experiments experts, and researchers in industry and other relevant scientific communities.

Frontier Technologies and Initiatives

- Collaborations and Partnerships
- Physics Software Engineering
- **Computing and Data Science**
- Technology Infrastructures
- Communications and Outreach
- Learning and Education
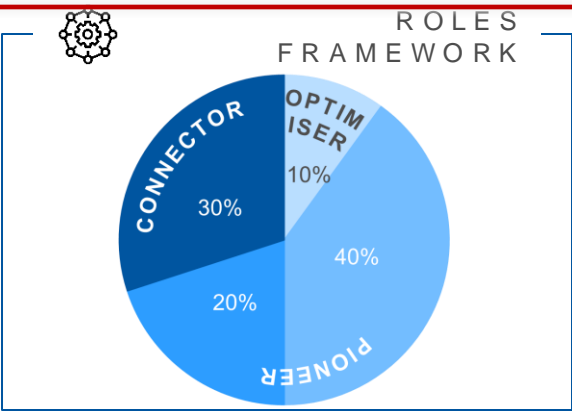
KEY ROLES & RESPONSIBILITIES

- Work closely with IT Department experts and the CERN and experiments community to identify areas of interests to introduce or expand the use of emerging technologies, such as AI and Quantum
- Design, develop, test, and assess technology proofs of concept in real-world scenarios
- Design and execute joint research projects with academia, industry, and international research organizations within and beyond HEP
- Contribute to Education, Communication and the further development of technical competences maximising the impact of the activities on CERN and society

MEASURES OF SUCCESS

- Number and impact on CERN activities of new prototypes and demonstrators showcasing new technology on realistic use case
- Number quality of scientific publications
- Increased impact of education and skills development in IT, CERN and beyond through support for internships and student projects (Master, PhD)

KEY CAPABILITIES

Technology R&D	Proof of Concept
Innovation	Collaboration

ROLES FRAMEWORK

- OPTIMISER 10%
- CONNECTOR 30%
- PIONEER 40%
- 20%

GOVERNANCE STRUCTURES

Bi-monthly Section leaders meetings

Weekly Section meetings

Weekly journal club (dedicated to new tech scouting and knowledge sharing)

Project meetings as necessary

PAIN POINTS ADDRESSED

- Communicating the role CERN IT plays in fostering a culture of continuous improvement and cutting-edge solutions more clearly
- Improve integration and exchanges among teams working on different techs (i.e. HPC, QC, AI, …) across IT Dep. and the Organization

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Cutting edge technologies…

Focus is on the technology itself.

    Primarily Quantum Computing and Artificial Intelligence

Build prototype applications

    Not necessarily bound by **production-level constraints/requirements or integration**

    Can expand to a **wide set of use cases**

Our studies have to contribute to the development and understanding of the technology itself .. at its core!

    Need to strive to be constantly up to date with the state of the art

Cooperation, collaboration, codevelopment, …

We cannot work in isolation

    We should become a «center» of expertise that can work on a range of use cases as broad as possible

    ..and we can certainly learn about the technology by working on different applications!

Improve links within our group!

    Already a recent nice initial discussion with the Software Engineering section. Can we do more?

Build collaborations within CERN

    Within IT, with other CERN Depts.

    On physics or infrastructure applications

Build collaboration beyond CERN

    With the HEP community, with other sciences.

    With academia and industry.

We need to contribute to knowledge sharing and raise technology awareness within the Laboratory

    There should be strong cooperation with the **communication and education teams**

In practice

People:

BARTHE, Alice Marie

GROSSI, Michele

KISS, Oriel Orphee Moira

LUISE, Ilaria

RIEGER, Carla Sophie

ROBBIATI, Matteo

VALLECORSA, Sofia

Most of our work is research on AI and QC and the topic of PhD theses.

We are a very «young» section ☺

In order to grow:

- **We need to build a more layered structure for expertise building and supervision**

  New members will join next year: PhDs, ORIGIN, QUEST

- **We need to increase the opportunities for knowledge sharing, cooperations, exchanges**

  Will restructure the meeting calendar within the section

Our work

At the moment most of our work is related to Quantum Computing:

We coordinate QTI (*Sofia*)

We coordinate the Quantum Computing QTI Center of Competence (*Michele*)

We develop algorithms and PoC to understand and improve usability of QC in HEP (*Alice, Oriel, Carla, Matteo*)

Our engagement in Artificial Intelligence can generate major impact with SoA projects:

We develop one of the best performing weather forecasting tools AtmoRep (*Ilaria*)

We contribute to defining a broader AI «awareness» and AI strategy within the Lab (*Sofia*)

We study Foundation Models (upcoming)

We develop Anomaly Detection with societal applications (LIST-WFP joint project - upcoming)

Outlook

We have an opportunity to create an «expert» critical mass (QC, AI, …) in IT

Expanding the IT Dept service centric approach

We should help to «introduce» the use of new technologies within IT services

We can play a role in most important CERN level «Frontier Technology» initiatives

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In order to achieve this, we need

Everybody's commitment towards maximizing impact in IT, CERN and HEP

and

Everybody's willingness to move beyond the immediate scope of their PhD thesis, project objectives, etc.. and think «bigger»

Can we do it together ☺ ??