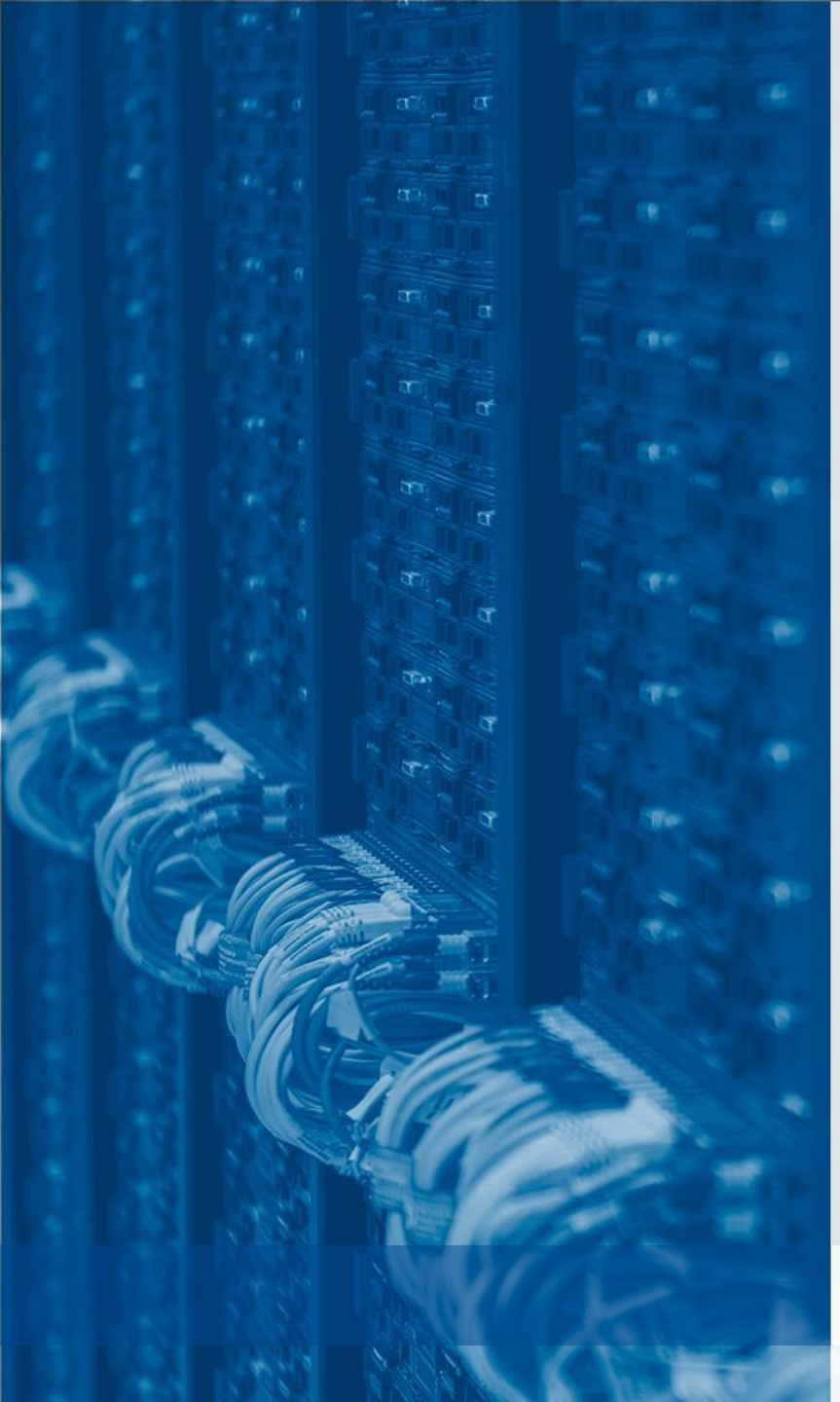

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Tensor Networks Workshop - Circuit Simulation

Jofre Vallès-Muns (he/him)

Tensor Network Workshop

- First of all, go to https://github.com/bsc-quantic/benasque-notebook and download the repository!

```
git clone https://github.com/bsc-quantic/benasque-notebook
```

- Then install the dependencies

```
julia --project=. setup.jl
```

BSC - Quantic group

- BSC hosts the ~~**MareNostrum4**~~ **MareNostrum5** supercomputer.
- We will also have a Quantum Computer “soon”!
- In our group we develop a set of Julia libraries that enable us to work with Tensor Networks in High-Performance Computing (HPC) systems.

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What is Julia? Why Julia?

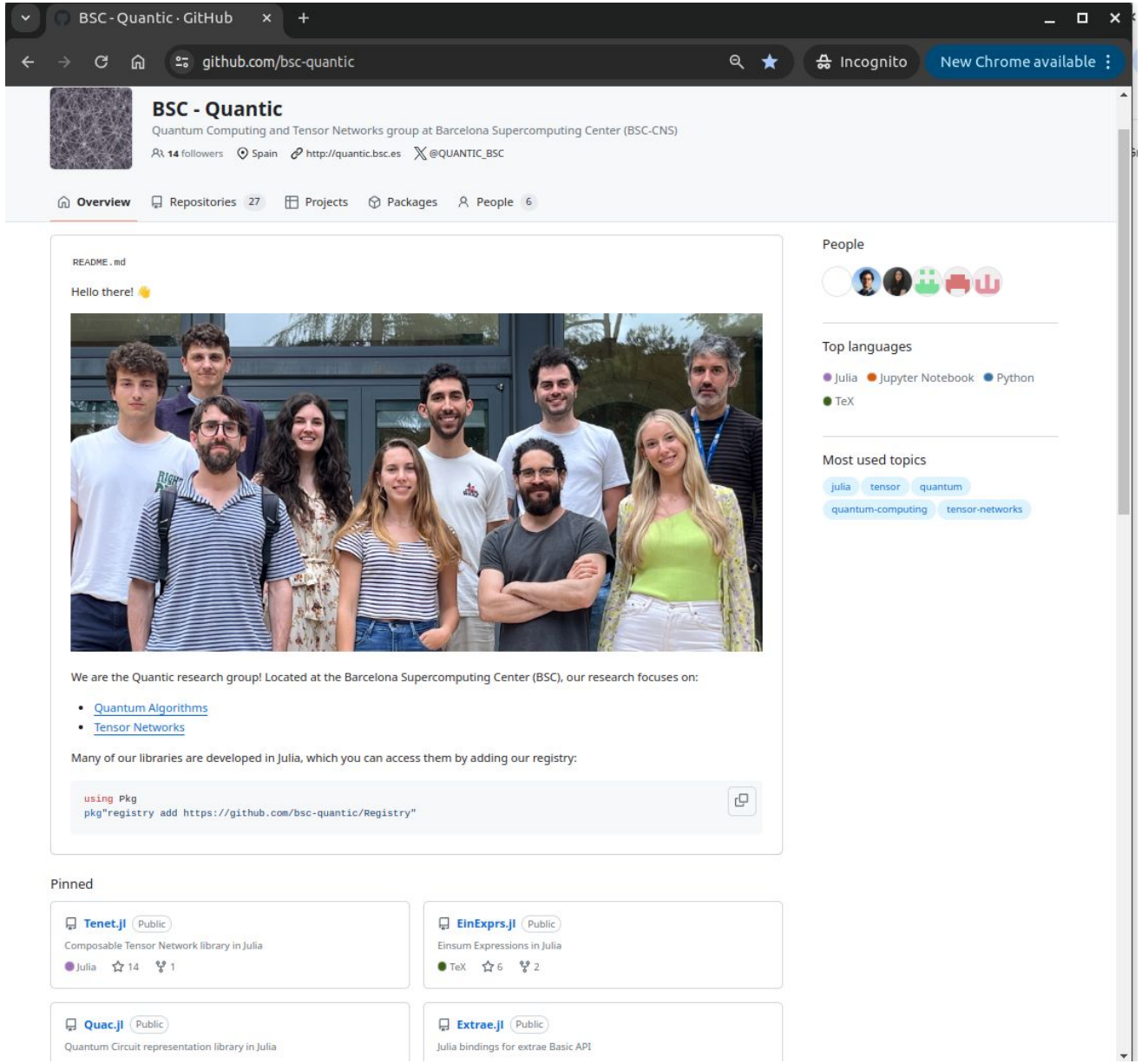
- Julia is a high-level programming language that is designed for High Performance
- It aims to solve the **2 language problem**:
  - As simple and readable as Python…
  - …but as performant as C
- It provides a strong support for mathematical operations, arbitrary precision, compilation, …
- Recently it has gained a lot of attention in the scientific community

Which libraries?

- Quac.jl (**Qua**ntum **C**ircuits): Creation and manipulation of quantum circuits, quantum gates, …
- Tenet.jl (**Ten**sor **Net**works): Manipulation of tensors, tensor networks, …
- EinExprs.jl: Optimization of contraction paths.
- Qrochet.jl: Manipulation of tensor networks ansatzes (MPS, MPO, …), focused on quantum.

Which libraries?

- You can check the `BSC-Quantic` Github page for all our libraries and its documentation.
- github.com/bsc-quantic



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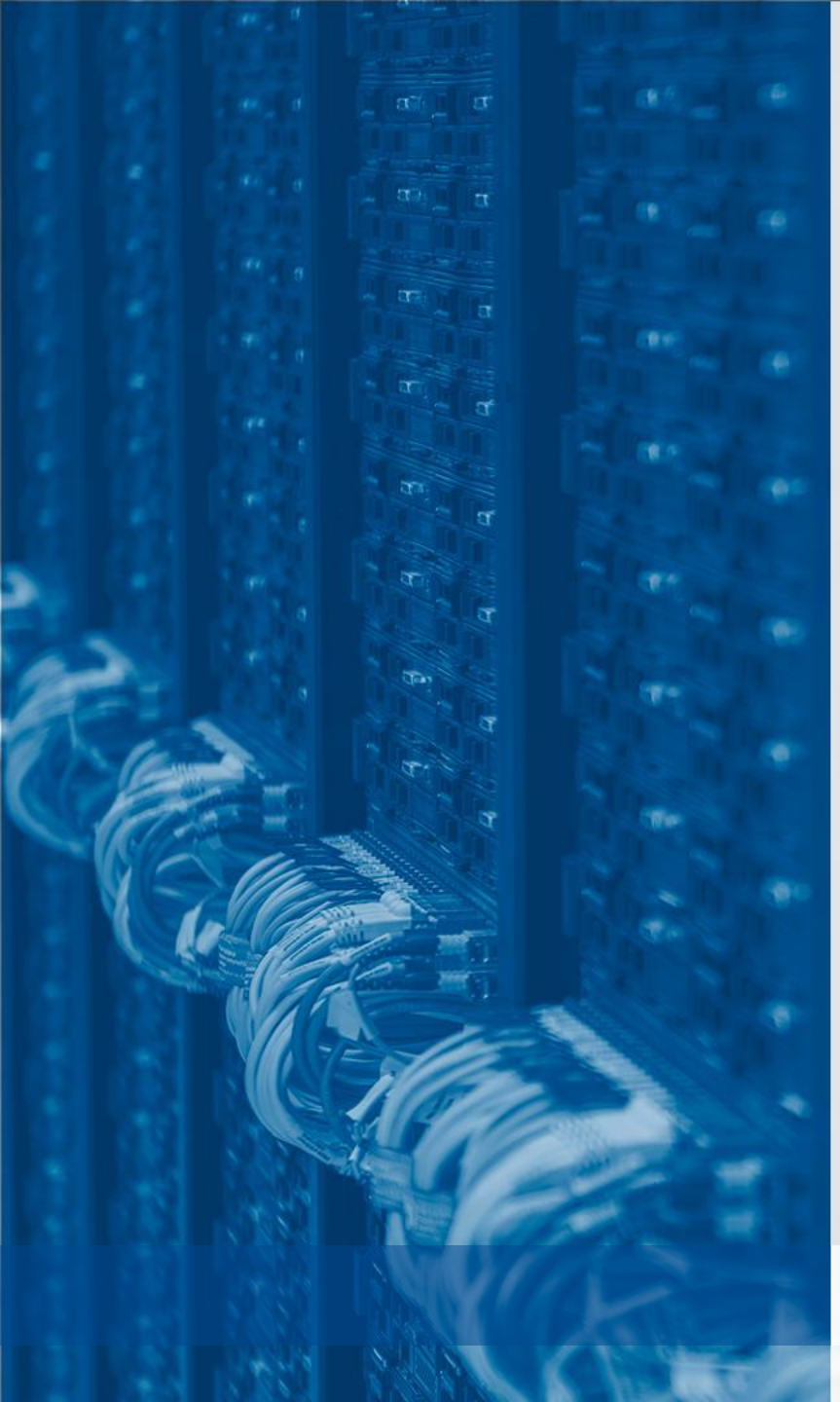

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