



**Barcelona
Supercomputing
Center**

Centro Nacional de Supercomputación

Tensor Networks Workshop - Circuit Simulation

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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.



What is Julia? Why Julia?

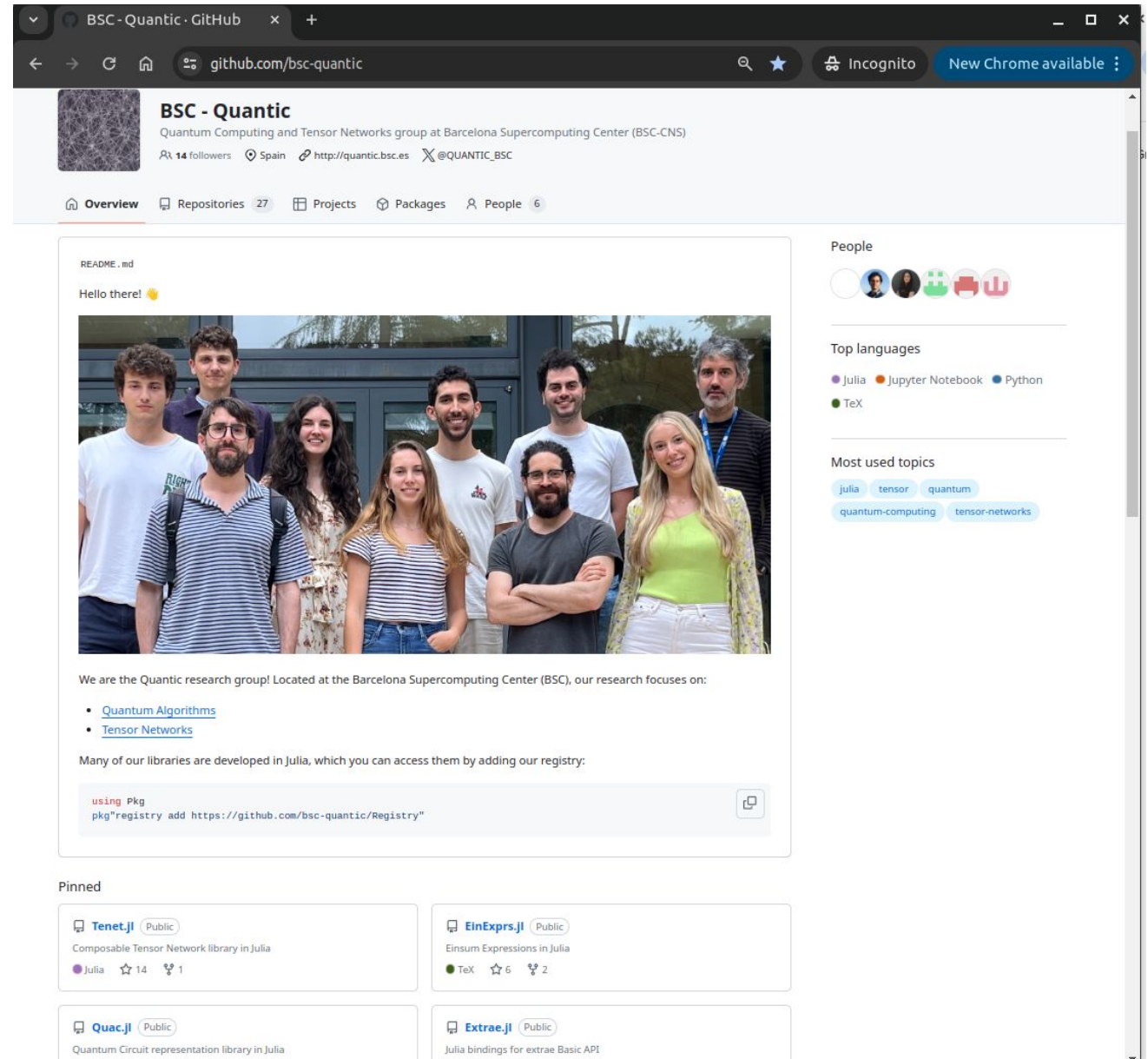
- Julia is a high-level programming language that is designed for High Performance
- It aims to solve the **2 language problem**:
 - As simple and readable as Python...
 - ...but as performant as C
- It provides a strong support for mathematical operations, arbitrary precision, compilation, ...
- Recently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

Which libraries?

- Quac.jl (**Q**uantum **C**ircuits): Creation and manipulation of quantum circuits, quantum gates, ...
- Tenet.jl (**T**ensor **N**etworks): 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




The screenshot shows the GitHub profile for BSC-Quantic. The header includes the repository name, a description as the 'Quantum Computing and Tensor Networks group at Barcelona Supercomputing Center (BSC-CNS)', and statistics like 14 followers and location in Spain. The main content area features a README file with a group photo of the team and text describing their research focus on Quantum Algorithms and Tensor Networks. It also provides instructions on how to add their registry to a Julia project. On the right sidebar, there are sections for 'People' (team members), 'Top languages' (Julia, Jupyter Notebook, Python, TeX), and 'Most used topics' (julia, tensor, quantum, quantum-computing, tensor-networks). The 'Pinned' section at the bottom displays four repositories: Tenet.jl, EinExprs.jl, Quac.jl, and Extrae.jl, each with a brief description and statistics.

BSC - Quantic
Quantum Computing and Tensor Networks group at Barcelona Supercomputing Center (BSC-CNS)
14 followers · Spain · <http://quantic.bsc.es> · @QUANTIC_BSC

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README .md
Hello there! 🌟



We are the Quantic research group! Located at the Barcelona Supercomputing Center (BSC), our research focuses on:

- [Quantum Algorithms](#)
- [Tensor Networks](#)

Many of our libraries are developed in Julia, which you can access them by adding our registry:

```
using Pkg
pkg"registry add https://github.com/bsc-quantic/Registry"
```

Pinned

- Tenet.jl** (Public)
Composable Tensor Network library in Julia
Julia · 14 stars · 1 fork
- EinExprs.jl** (Public)
Einsum Expressions in Julia
TeX · 6 stars · 2 fork
- Quac.jl** (Public)
Quantum Circuit representation library in Julia
- Extrae.jl** (Public)
Julia bindings for extrae Basic API



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