Scientists AI JAMs

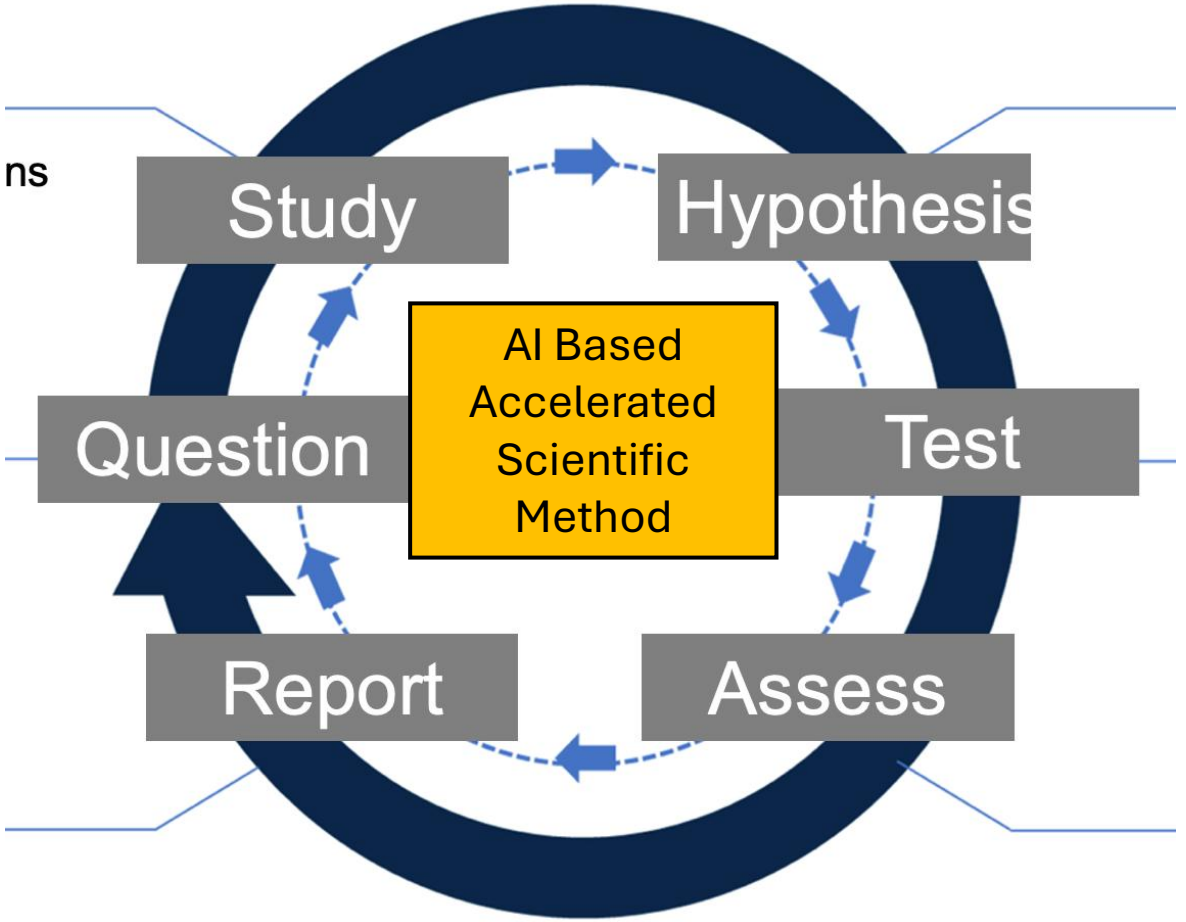
Jean-Yves Berthou (Inria), Stéphane Requena (GENCI), Mohamed Wahib (Riken), Nicolás Wolovick (Universidad Nacional de Córdoba), Fabricio Carraro (BSC), Gabriel Hautreux (CINES),

Franck Cappello (Argonne)

EAIRA paper: https://arxiv.org/abs/2502.20309

Accelerating Science with AI

- Advanced AI models (LLMs, Foundation models, Diffusion networks, Co-scientists) can be used in many tasks of the research workflow
- AI Jams focus on 1) introducing AI to researchers/engineers who have not already integrated it in their workflow
- Give access to the best available models to participants
- Identify what tasks researchers/ingeneers want to accelerate
- Identify strengths and weaknesses

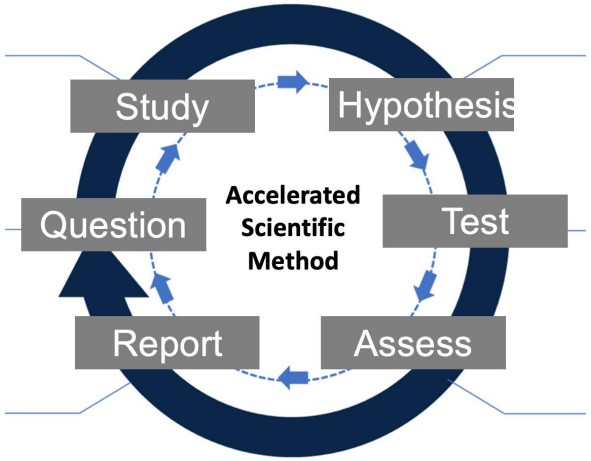


https://doi.org/10.1038/s41524-022-00765-z

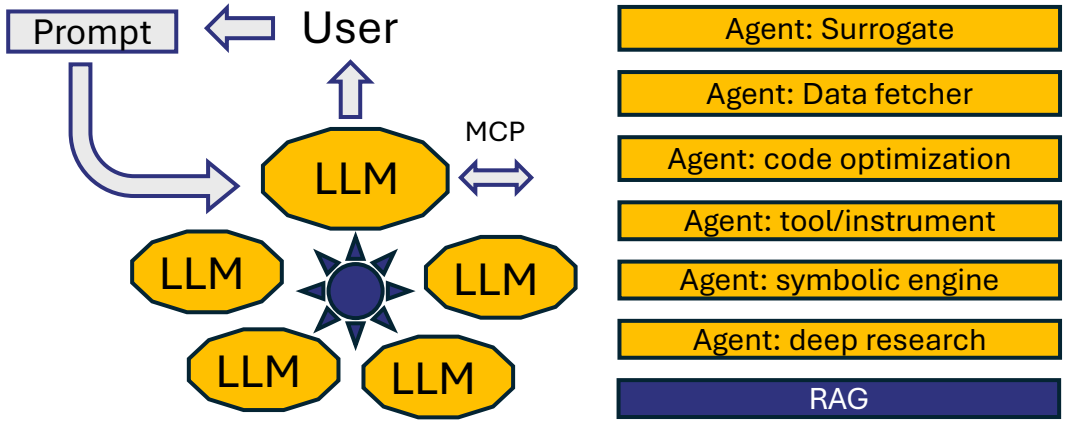
AI: From Task Specialist to Collaborator

AI based acceleration

ML, DL, LLMs, Multi-Agents, Diffusion network, etc.

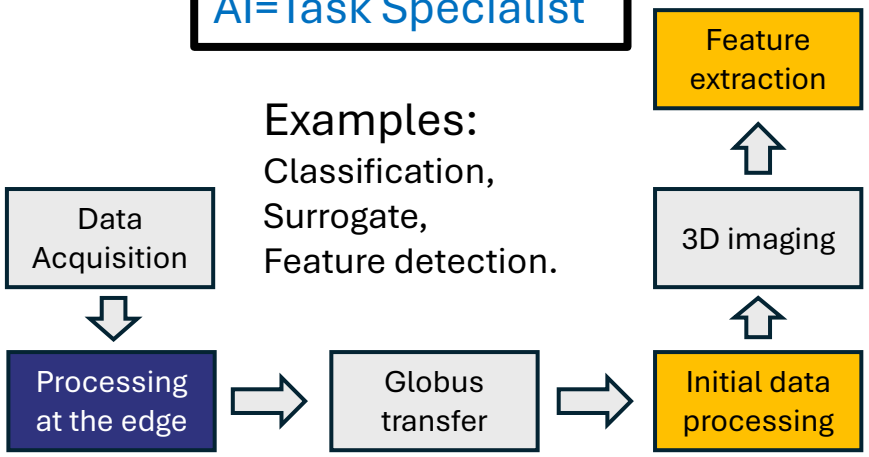


Hypothesis Generation
AI: Research Collaborator

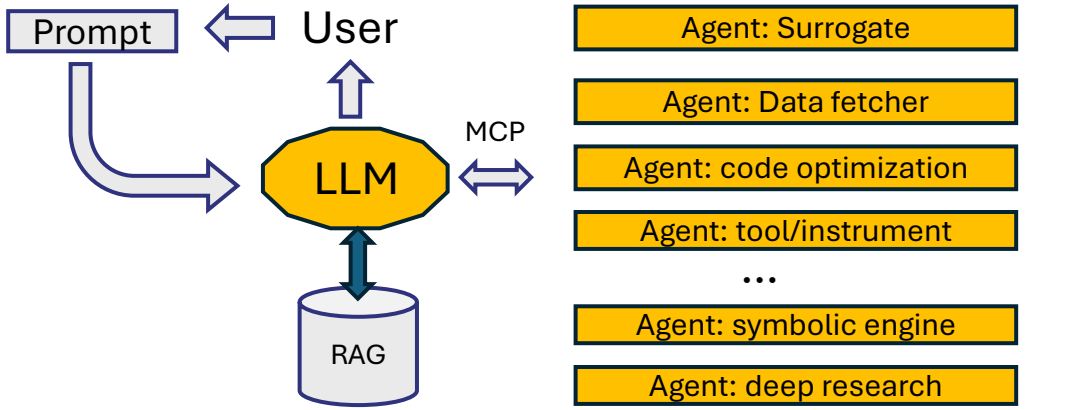


Task Acceleration
AI=Task Specialist

Examples:
Classification,
Surrogate,
Feature detection.



Workflow Acceleration
AI: Research Assistant



End-to-End Eval: ~~1000~~ 1500 Scientists AI JA in 9 Labs Simultaneously (Feb.28, 2025)

Researcher participation and contributions on a voluntary basis.

1,000 Scientists Jam Session: Domains

Researcher participation and contributions on a voluntary basis.

Literature/Data

- Literature search, analysis, survey
- Data analysis and forecast, interpolation, extrapolation, classification (Point Cloud, signal, protein sequences, files, etc.)
- Anomaly detection
- Signal Analysis
- Scientific Visualization

Coding

- Algorithm design/optimization
- Automatic code generation/refactoring
- Code translation
- Debugging codes (sequential, parallel)
- Automatic code performance tuning/optimization
- Identifying performance bottlenecks

Experiments

- Automatic tuning of instruments
- Experimental Design (including autonomous workflow)
- Dark mater experiment design

Bio

- Understanding mechanisms of Cancer
- Understanding radiation effects on human cells
- Predictive Genomic Models

AI

- Domain specific LLMs/Agents (use LLMs as foundation models)
- Hyper parameter exploration for DL training.

Physics

- Battery design
- Chemical Mechanisms
- Physics beyond standard model

Infra.

- Infrastructure modeling and resilience
- Natural Disaster assessment

Math

- Surrogate model
- Mathematical derivations
- PDE solving
- Convergence proving
- Equation validity testing
- Derivative analysis
- Uncertainty estimation
- Inverse problems
- Statistical modeling

Argonne NATIONAL LABORATORY

Japan Scientist AI Jam Session

Online Tutorial: Nov. 11
225 participants

Dry Run: Nov. 28
50 participants

AI Jam (Tokyo): Dec. 16
124 participants

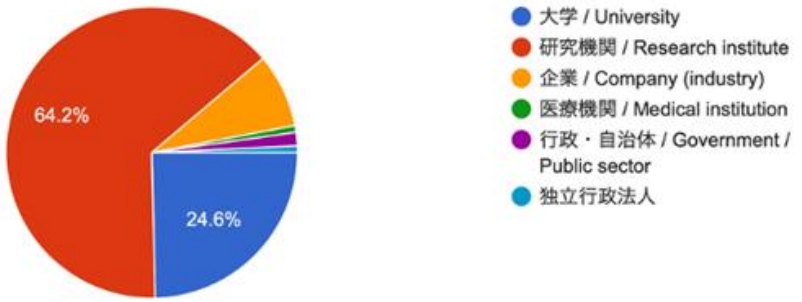
AI Jam (Kobe): Dec. 18
95 participants

Model providers: OpenAI, Anthropic, Google, AWS, NVIDIA
Q&A through Discord
Collection tool using Chrome browser extension
RIKEN open model platform + MCP server

Post-Jam Survey

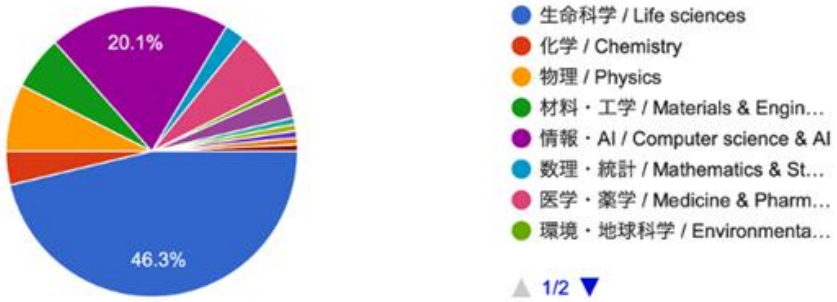
所属機関の種別（単一選択） / Type of organization (Single choice)

134 responses

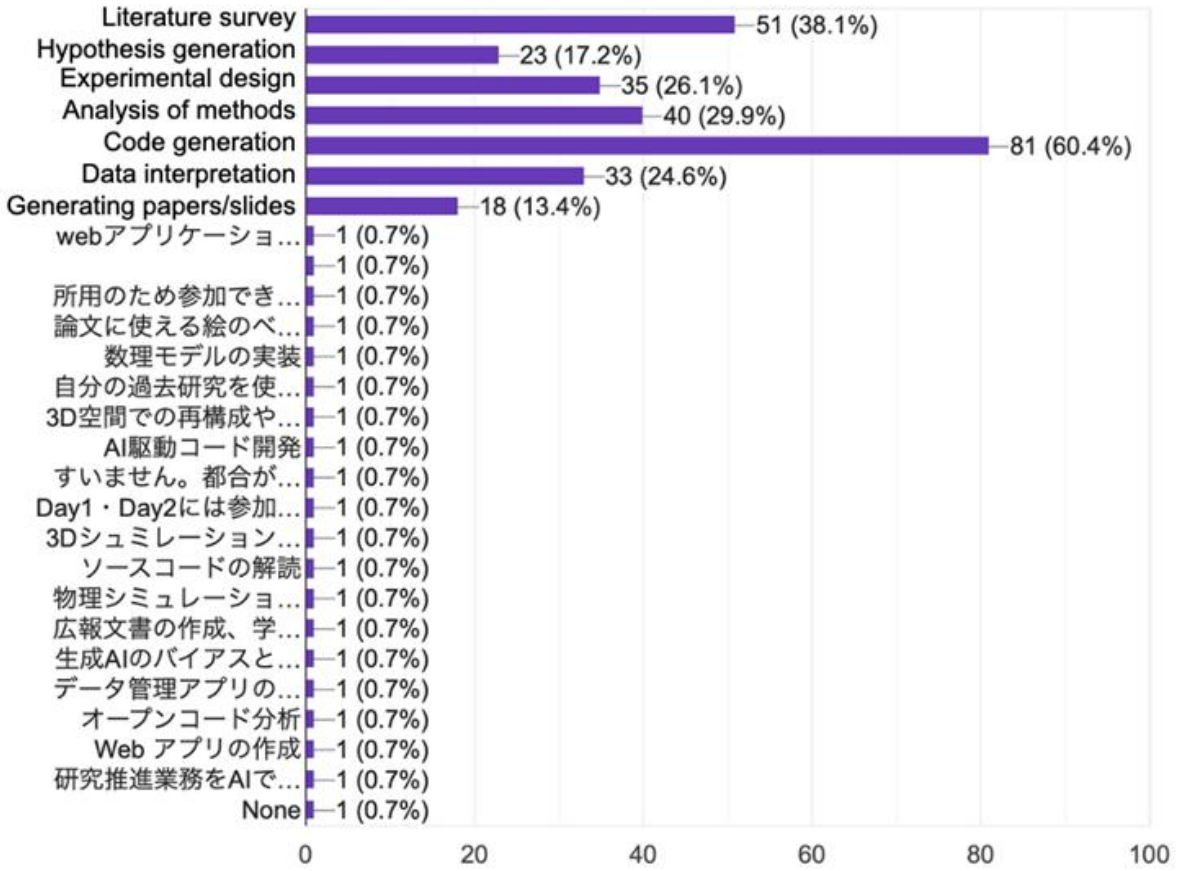


研究分野（単一選択） / Research field (Single choice)

134 responses



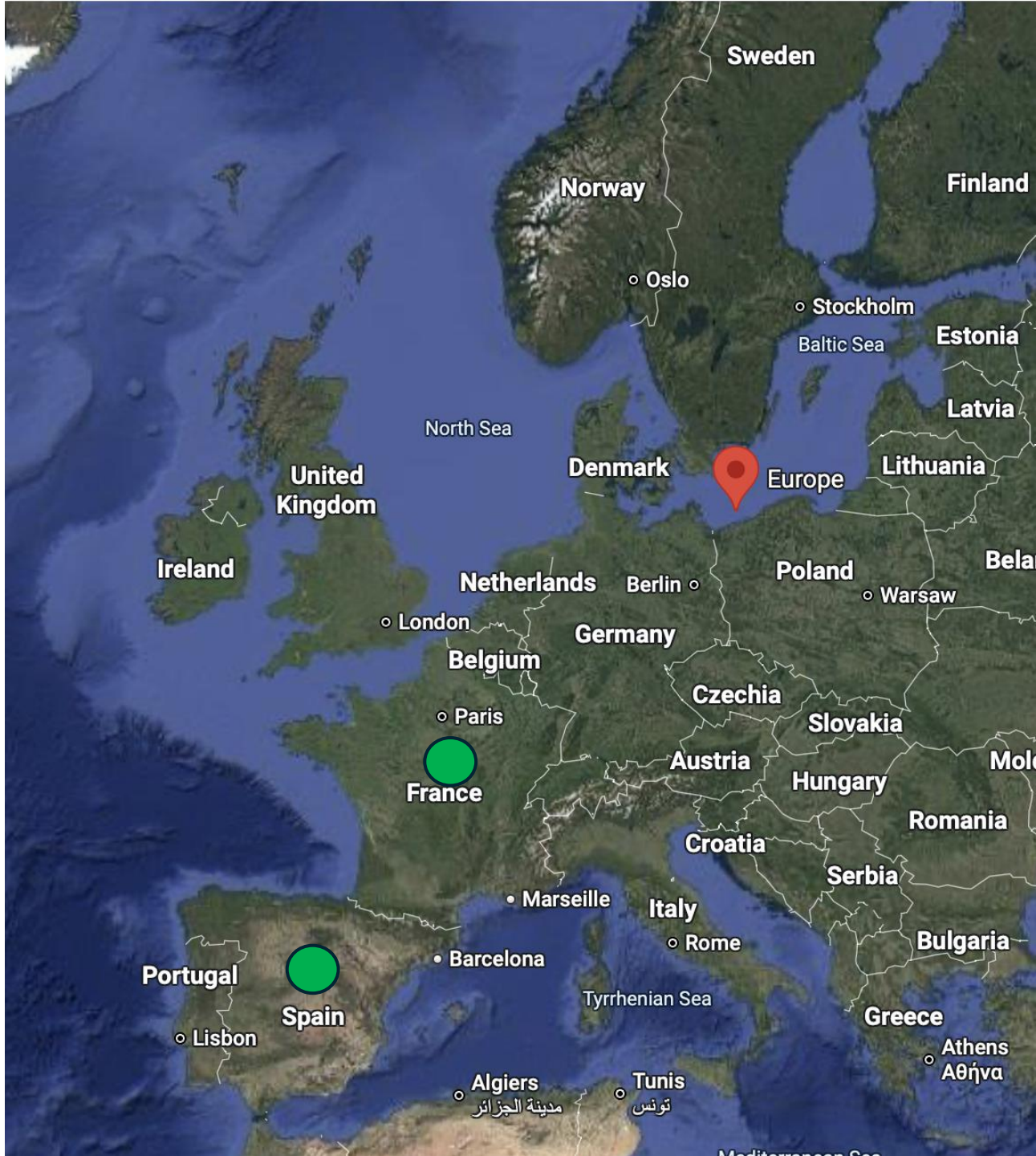
今回取り組んだ課題のタイプ（複数選択） / Task type(s) worked on (Multiple choice)



Argonne NATIONAL LABORATORY

EU/Franck/Spain AI JAM

- Short presentation of the US and Japan AI Jams (30 min.)
- Organization of the France/ Spain 1 day AI Jams (45 min.)
- Long term international focused AI Jam (45 min.)



Schedule

- Short presentation of the US and Japan AI Jams (30 min.)
- Organization of the France/Spain 1 day AI Jams (45 min.)
- Long term international focused AI Jam (45 min.)

US and Japan AI Jams

Organization of the France/Spain 1 day AI Jams

Objective: have scientists experience the best available LLMs/co-scientists

Questions to discuss:

- Timing: when in 2026 (Fall?)
- What population
- What problems
- What industry players
- Open models?
- Collection or not of the interactions
- Logistic issues
- Budget

Organization of the France/Spain 1 day AI Jams

Comments:

- Contact frontier model companies (important to seek several EU as well as US and CN models)
- Ask to access the latest most performant model (pro series typically)
- Negotiate with companies no collection of interaction, no training of their models on prompts
- Define the application process + communication plan
- Participants training /dryrun before actual JAM. Include scientific data integration.
- Ask companies to provide experts to help participants use models
- Potentially, have researchers expert in AI as helpers for the participants
- Embed AI Factory experts
- Ask participants to prepare problems to solve in their domains (and clearly define their domains during the application process).
- Encourage participants to work in groups (by domains)
- Record interaction with tools provided by Argonne and Riken

Organization of the France/Spain 1 day AI Jams

Other questions/comments:

1. France/Spain: we could already embed other EU countries like Finland, Germany and Italy as well since the beginning
2. Open Models: Remotely accessible? Do we also need to deploy on premise models? Providing compute hours might be a limitation for some model providers
3. How do we convince model provides: Model providers are partly involved in European AI Factories, could be a way to convince them
4. Important to seek several EU as well as US and CN models: important to consider
5. Participant training: This might need the on premise deployment, as scientific data could be huge. Should we limit the scientific data volume to only work remotely? I don't think so

Long term international focused AI Jam

Objective: Explore and potentially solve hard very high impact research questions

Organization: 1 group per question. Group of 10-12 motivated international partners

Questions to discuss:

- How groups are formed (invitation, call, selection)?
- How we convince model providers?
- Parameter definition of targeted problems

Long term international focused AI Jam

Conditions: Non-patentable research questions that serve humanity with no or very little competition between countries:

Examples:

- Cures for mass diseases (If we did it for Covid without AI, we should be able do it for other diseases with AI!)
- Cosmology (progress in understanding dark matter, dark energy)
- Unification of physics: progress in unifying quantum physics and general relativity (this problem is actually very seriously considered by top physicists).
- Algorithms: P = NP? (if Claude solved the Knuth problem of embedding n hamiltonian cycles in nD torus in 1h that Knuth tried for 3 weeks, what can be achieved in 1000h of Claude?)
- Development of joint tools like physics based tokenisers, RAG tools, ...???

Long term international focused AI Jam

Requirements: Frontier model access: ask access for 1 year to OpenAI, Anthropic, Google, Mistral, etc.

Organization ideas:

1. Every group meets virtually twice a month (Zoom or equivalent) and share progress. They will also meet in person 2 times a year during the International AI4Discovery Challenge Conference.
   Potential Strategy (probably quite hard to implement): evolutionary: partners explore different directions. Every month the top 3 promising directions become starting points for the 10-12 partners. 1 year will produce 12 generations.

2. We could also in the middle think about thematic Jams, Jam for climate, Jam for material sciences etc … ?