How can the macroeconomic impact of a Hyperloop route be quantified and predicted for the connected regions?
Who am I?

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What exactly is The Hyperloop?
Elon Musk's Hyperloop Alpha

- Magnetic Levitation & Propulsion
- Pressurized Tube Interior
- Fast ~ 1200 km/h
- Sustainable Low Emissions

Category of the Challenge: City
The team

- 93 students
- 29+ countries
- 12+ faculties
TUM Hyperloop – pod competitions

- **Pod I (2017)**
  - 94 km/h
  - 600 kgs

- **Pod II (2017)**
  - 324 km/h
  - 85 kgs

- **Pod III (2018)**
  - 467 km/h
  - 70 kgs

- **Pod IV (2019)**
  - 482 km/h
  - 69 kgs
TUM Hyperloop - Research

- Research Pod III
- Research Pod IV
- Test Ring

Category of the Challenge: City
Cool, but what’s next?
TUM Hyperloop – full scale

Full Scale Test Track

Planned for 2022

24 meters long
Program mission statement

Developing a climate-neutral, ground-based transportation system, meeting the demand for ultra-fast connections between mobility hubs.
Project goal

- Study the technical, economic and safety-related feasibility of an Hyperloop system
- Build a Hyperloop system demonstrator that is capable of safe human transport
- Generate interest in hyperloop and boost public acceptance
Our current research packages

Industry and Trends
Where are Europe and Germany headed towards and where do we fit in?

Capital Expenditure Model
Which factors affect the costs and how do they affect the feasibility?

Macroeconomic effects
How would Hyperloop affect connected regions from a social and economic perspective?

Market and Route Selection
Where should we go?

Financials
How do we calculate the economical feasibility?
And this is where **YOU** come in!
**Market and route selection**

### Munich to Düsseldorf
- Travel time: 40 min
- Material costs: 18.6 B €
- Cost per km: 31.7 M €
- Yearly demand addressed: 9.1 M passengers

### Munich to Frankfurt
- Travel time: 25 min
- Material costs: 11.3 B €
- Cost per km: 31.7 M €
- Yearly demand addressed: 8.2 M passengers

### Munich to Hamburg
- Travel time: 70 min
- Material costs: 21.3 B €
- Cost per km: 29.1 M €
- Yearly demand addressed: 7.2 M passengers

### Munich to Berlin
- Travel time: 50 min
- Material costs: 15.6 B €
- Cost per km: 26.2 M €
- Yearly demand addressed: 7.3 M passengers

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**Yearly Passenger Demand per km**

- **MUC - BER**: 30000
- **MUC - FRA**: 25000
- **MUC - DUS**: 20000
- **MUC - HAM**: 15000

**Costs per km (€/km)**

- **MUC - BER**: 35000
- **MUC - FRA**: 30000
- **MUC - DUS**: 25000
- **MUC - HAM**: 20000

Credits: tumhyperloop.de
Current situation

$2 \text{ tn.}$

Globally in annual transport infrastructure investments until 2040 needed for economic development\(^1\)

42%

Increase in passenger demand by 2050\(^2\)

60%

Increase in cargo demand by 2050\(^2\)

Sources: (1) Global Infrastructure Outlook; (2) European Commission – Transport in the European Union;
How can **social benefits** be measured for regions connected by Hyperloop? For example:
- Social inclusivity
- Improvement quality of life etc.

How can **economic benefits** be measured for regions connected by Hyperloop? For example:
- Job creation
- Economic growth etc.

What **change in human behavior** reduces resource waste and how can **benefits be communicated**?
- Reduction of car/ truck usage for transport
- Commuting behavior etc.
Macroeconomic impact of a Hyperloop system

**Problem definition:** How can the macroeconomic impact of a Hyperloop route be quantified and predicted for the connected regions?

**Waste-Challenge:** Ever increasing mobility demand requires governments across Europe to continuously invest in infrastructure, connecting regions and increasing access to transportation. With Hyperloop providing ultra-high speed ground transportation (~ 850 km/h), long distances trips become minutes rather than hours, thereby revolutionizing the entire travel journey (e.g. Munich to Frankfurt in 30 mins vs. 3h). To convince governments, investors, and the public of the system’s benefits, TUM Hyperloop is searching for a scalable approach and initial results that convey and quantify the economic and social benefits of implementing Hyperloop routes. Some key questions the team is trying to answer:

- Based on a chosen route (e.g., MUC – FRA, MUC – BER), what macroeconomic dimensions would need to be analysed?
- How can societal, regional and economic impacts be quantified and which are the most relevant?
- Which trends could evolve from this radical drop in travel time e.g., mode switch for passenger/ cargo transportation, pollution reduction etc.?
- How can those results be successfully communicated to stakeholders?
Macroeconomic impact of a Hyperloop system

**Desired Impact:** Governments and investors are able to provide new transportation infrastructure in a way that yields impact beyond the mere movement between places. It creates economic and societal impact that is measurable. By being able to show those benefits, communication with decision makers and the public is result-driven and increases the chances of successfully implementing Hyperloop.

**Skills needed/recommended:**
No specific skills are needed in advance

**Relevant considerations for the challenge/theme:**
Given the complexity of the challenge, make reasonable simplification assumptions