POLIMI EDUCATION | TECHCAMP

COURSE PRESENTATION

Mathematics of GPS

22-26 June 2026

TEACHERS

Caterina Bassi, Domenico Brunetto, Alexandru Constantinescu, Alberto Roncoroni

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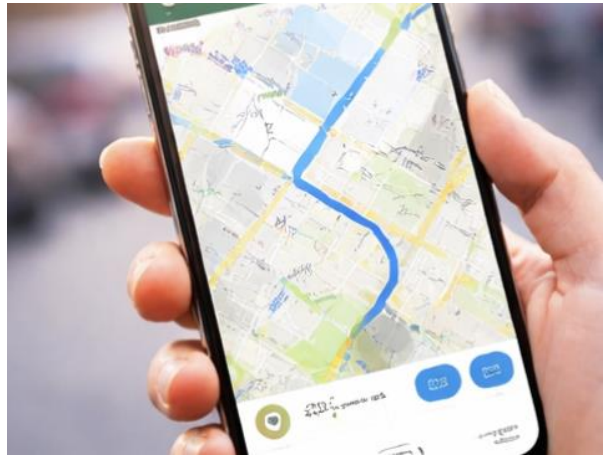
Why GPS?

GPS in everyday life

- Navigation apps
- Emergency services
- Logistics & transportation
- Sports …

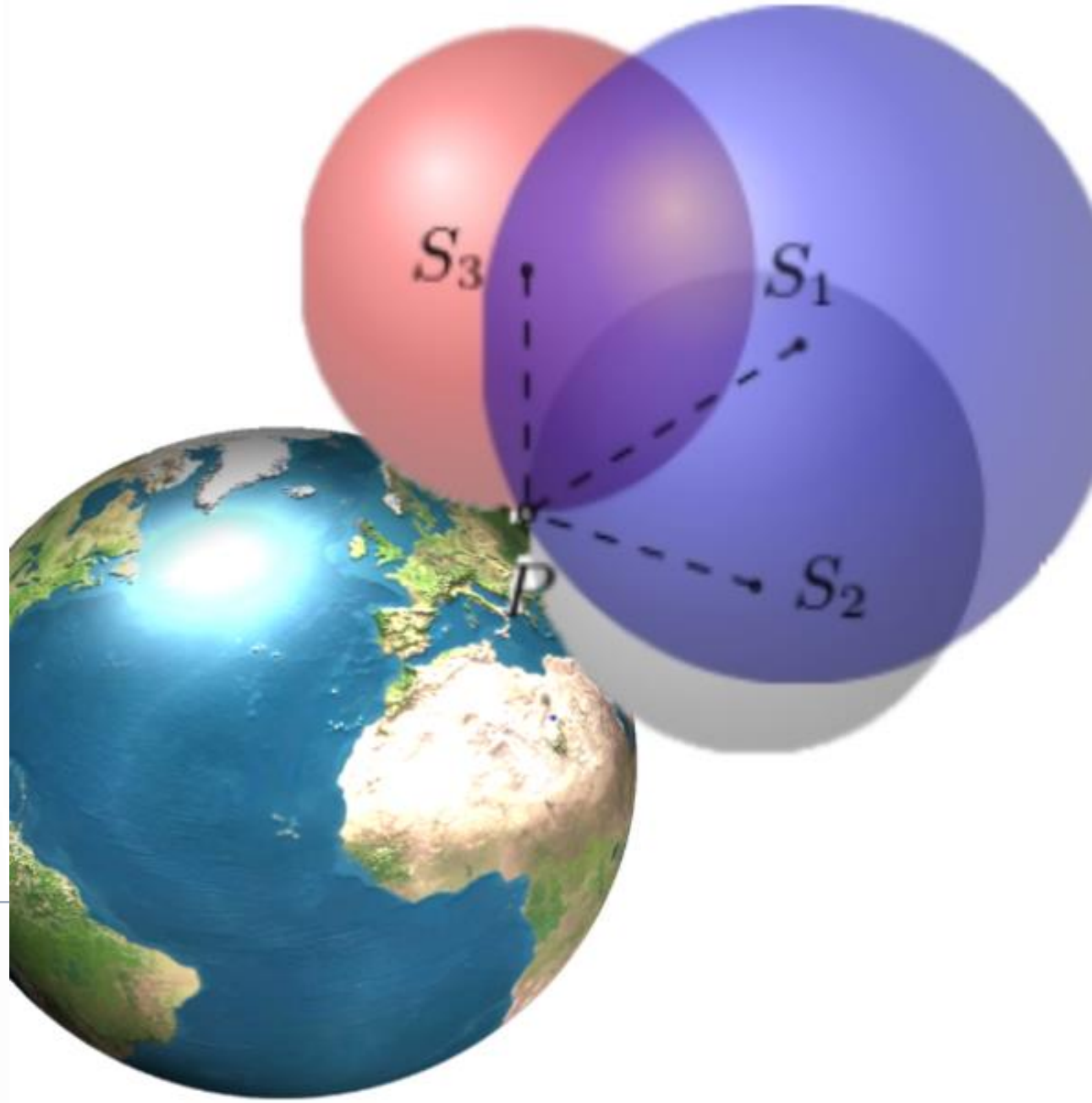
Behind a simple app there is advanced mathematics!



How does GPS work?

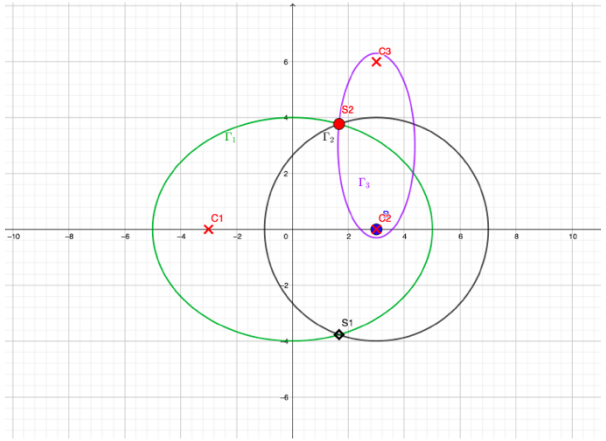
- Satellites send electromagnetic signals
- We measure distances from multiple satellites
- Mathematics calculates our position in space

Participants discover how math makes invisible signals measurable.



The mathematics behind GPS

- Mathematical modelling
- Mathematics to describe real-world phenomena
- Key mathematical topics:
  - Conic sections
  - Parametric curves
  - Trigonometry



$$\frac{(x - x_c)^2}{a^2} + \frac{(y - y_c)^2}{b^2} = 1$$

$$\begin{cases} x = x_C + a \cdot \cos\alpha \\ y = y_C + b \cdot \sin\alpha \end{cases}$$

Our teaching approach

- Gamified activities and challenges
- Short seminars
- Hands-on laboratories
- Collaborative teamwork
- Mathematics becomes concrete and tangible

Competencies students will develop

- Analyzing and building models of real-world situations
- Managing complexity, critical thinking and informed decision making
- Teamwork and effective communication
- Creating digital contents
- Using technology to support creativity

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Weekly program

Monday	• Team building and introduction game *Treasure Hunt* • From the problem to mathematics: introducing the ellipse • Deepening geolocation concepts
Tuesday	• Deepening conic sections and parametric curves • Introduction to MIT App Inventor
Wednesday - Thursday	• Teamwork: development of the *Treasure Hunt App* • Seminars and project work • Writing the project report
Friday	• Finalising the report • Presentation of student projects

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