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Future  
Artificial  
Intelligence  
Research

## Spoke 5

# High-Quality AI

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## Partners

7 Sapienza Dept. + 3 CNR Institutes

faculty members: **30** (Sapienza) + **4** (CNR)

new researchers: **18** (Sapienza) + **3** (CNR)

new PhD: **8** (Sapienza)



SAPIENZA  
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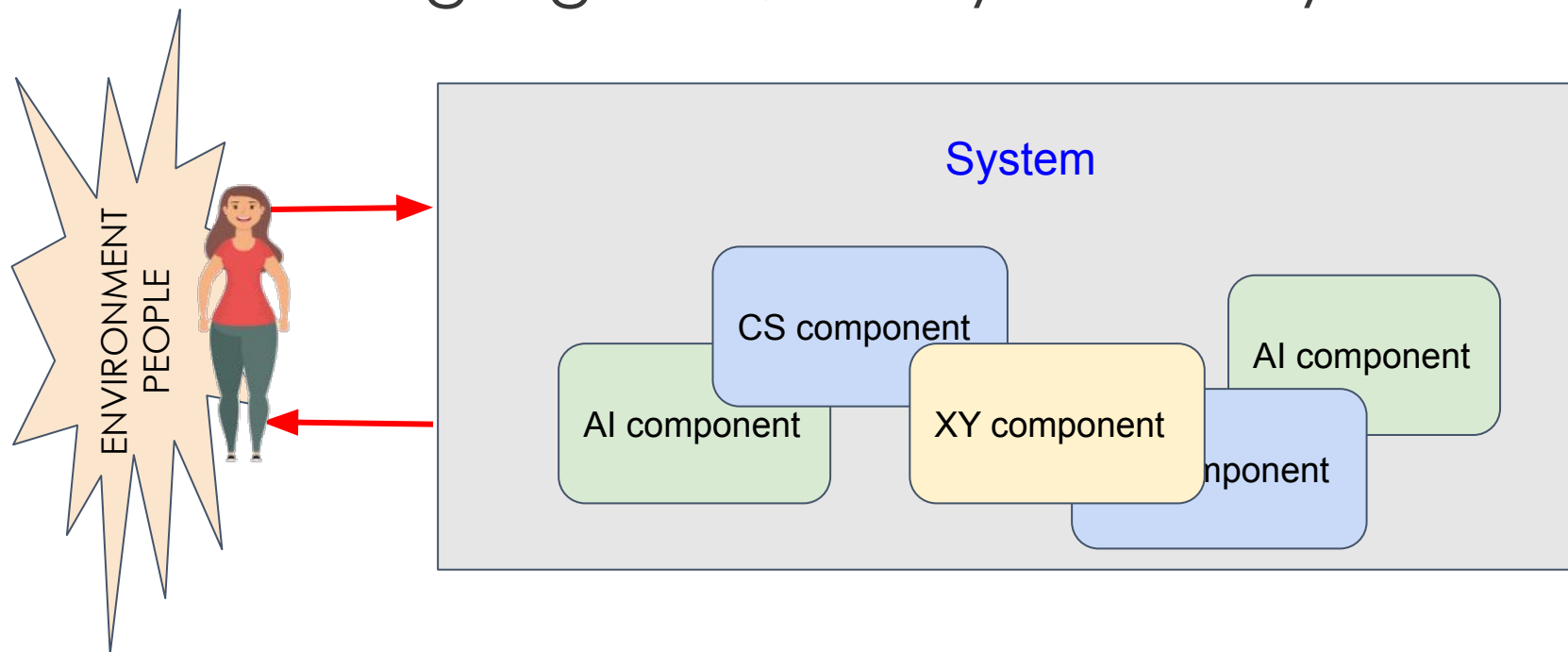


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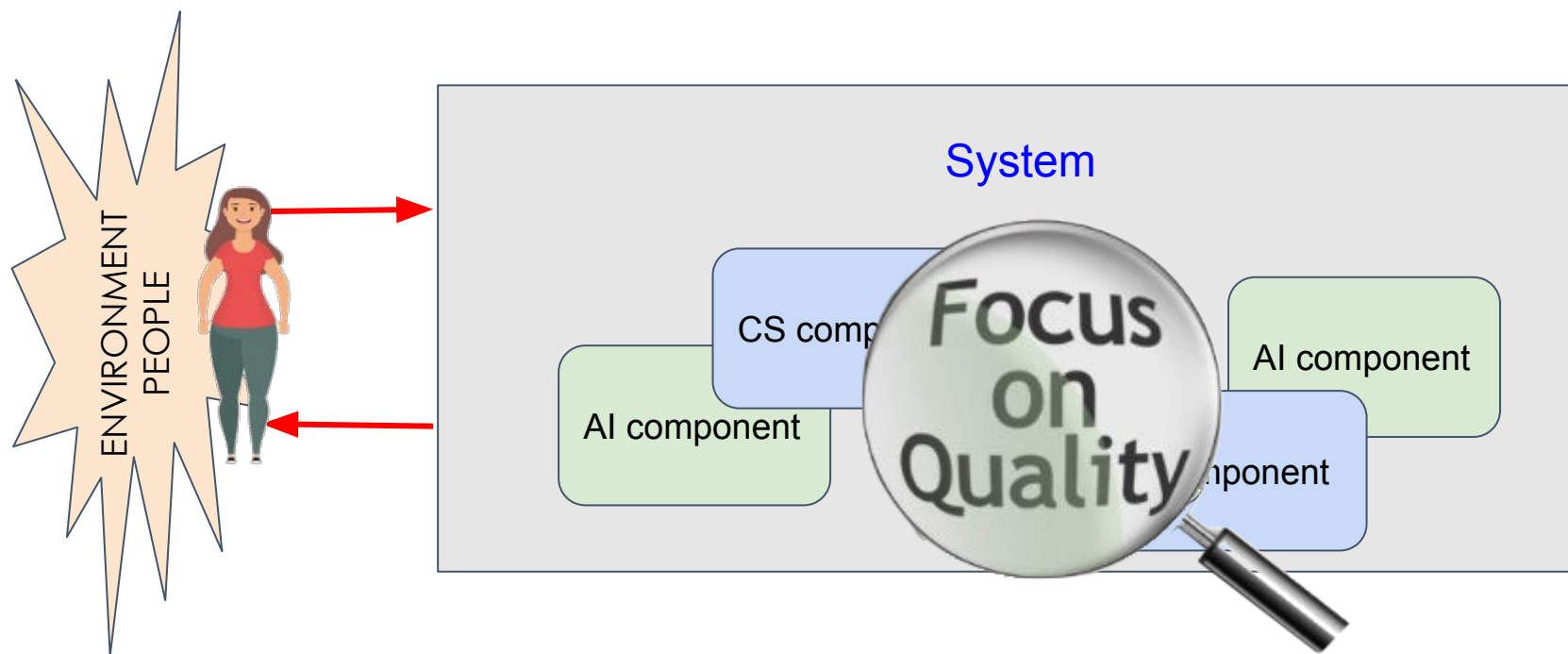
# High-quality AI Motivation

- **AI-empowered dynamic systems** (Human-AI teams) including high-risk, safety critical systems



# High-quality AI Motivation

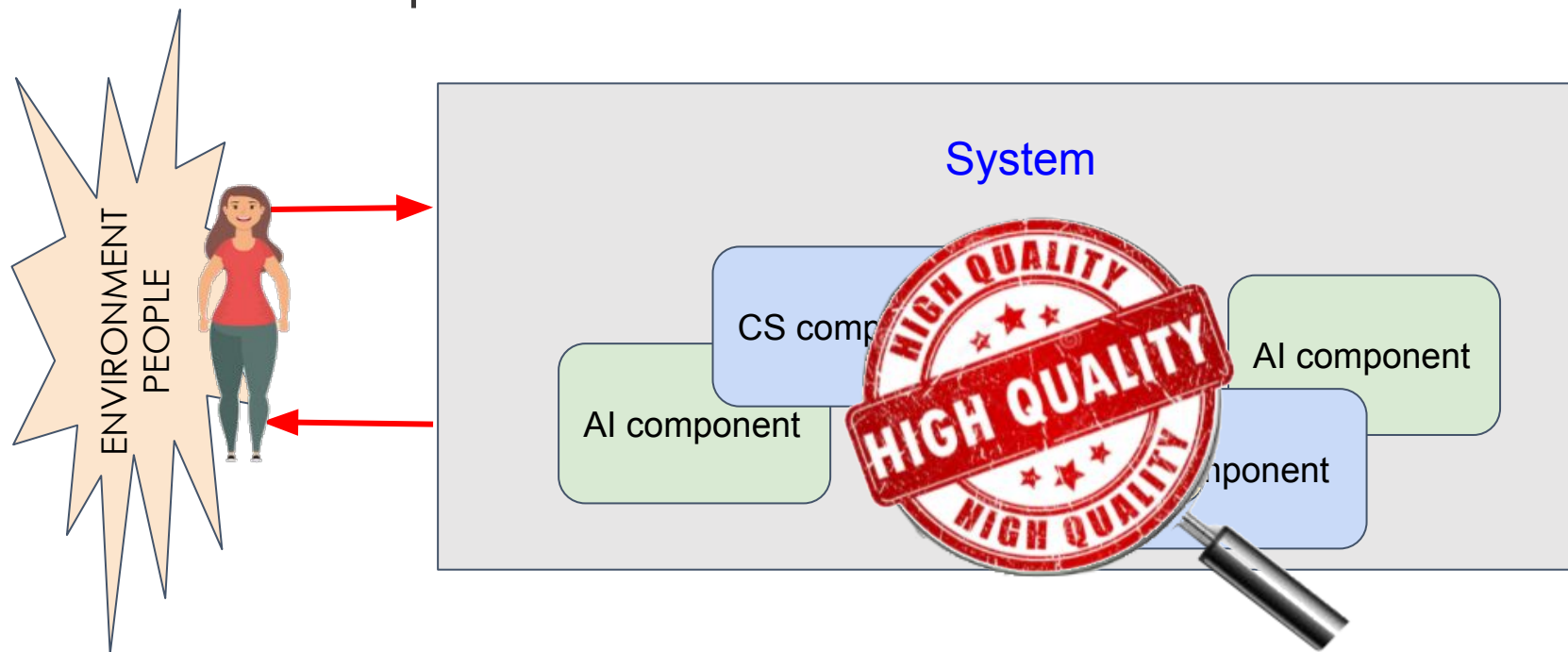
- Demand to meet **high quality requirements** and **certification** standards





# High-quality AI Objectives

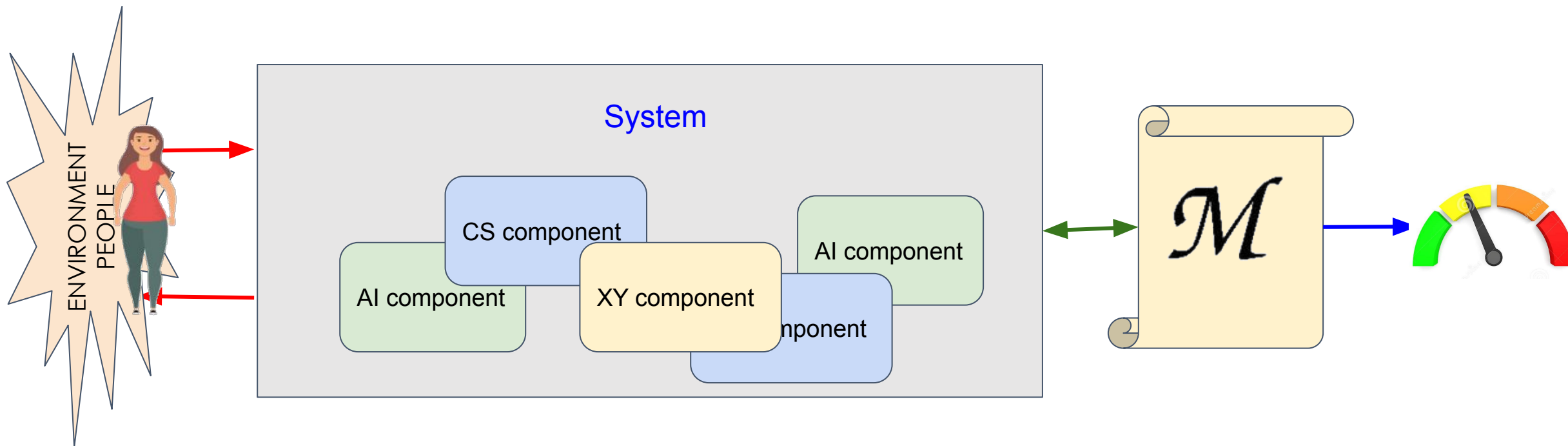
- Develop **measurable qualities** and assessment/certification techniques





# High-quality AI Methodology

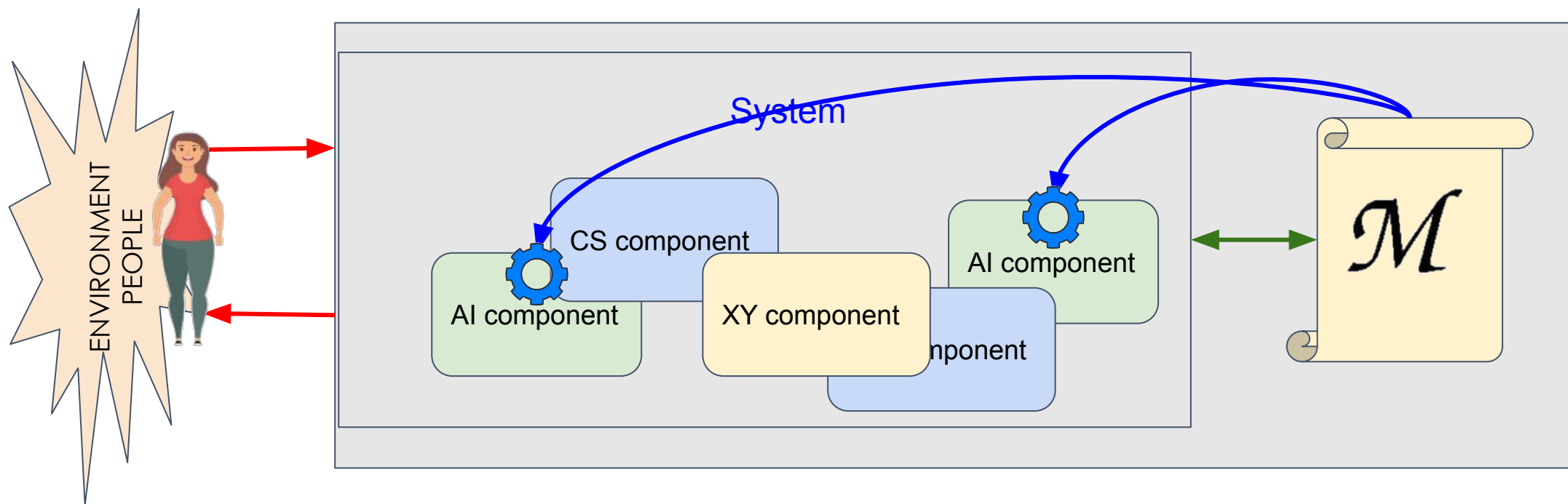
- Rigorous mathematical methods for formal guarantees





# High-quality AI Methodology

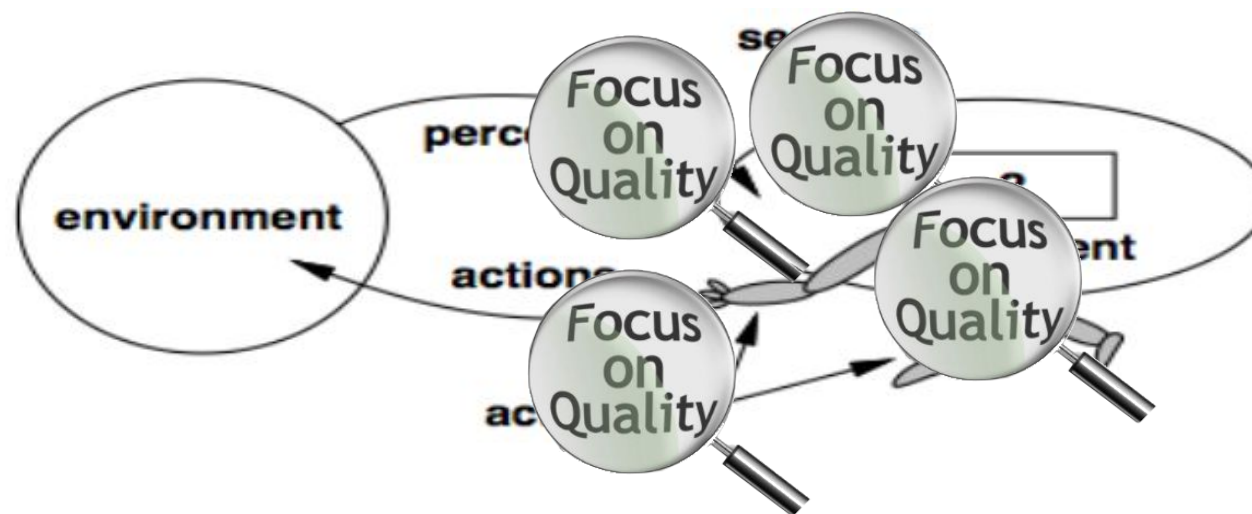
- AI systems able to self-assess the qualities of their outcomes (turn to human supervision if needed)





# High-quality AI Methodology

- Whole AI: perception, actuation, learning, modeling, reasoning and planning







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# Research questions

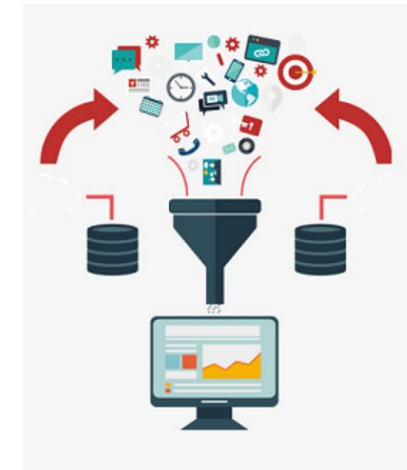
Which formal, mathematical, scientific, engineering, and ethical qualities ...

**Q5.1** Autonomous AI systems

**Q5.2** Data-centric AI systems

**Q5.3** Generative AI systems

**Q5.4** Machine Learning systems



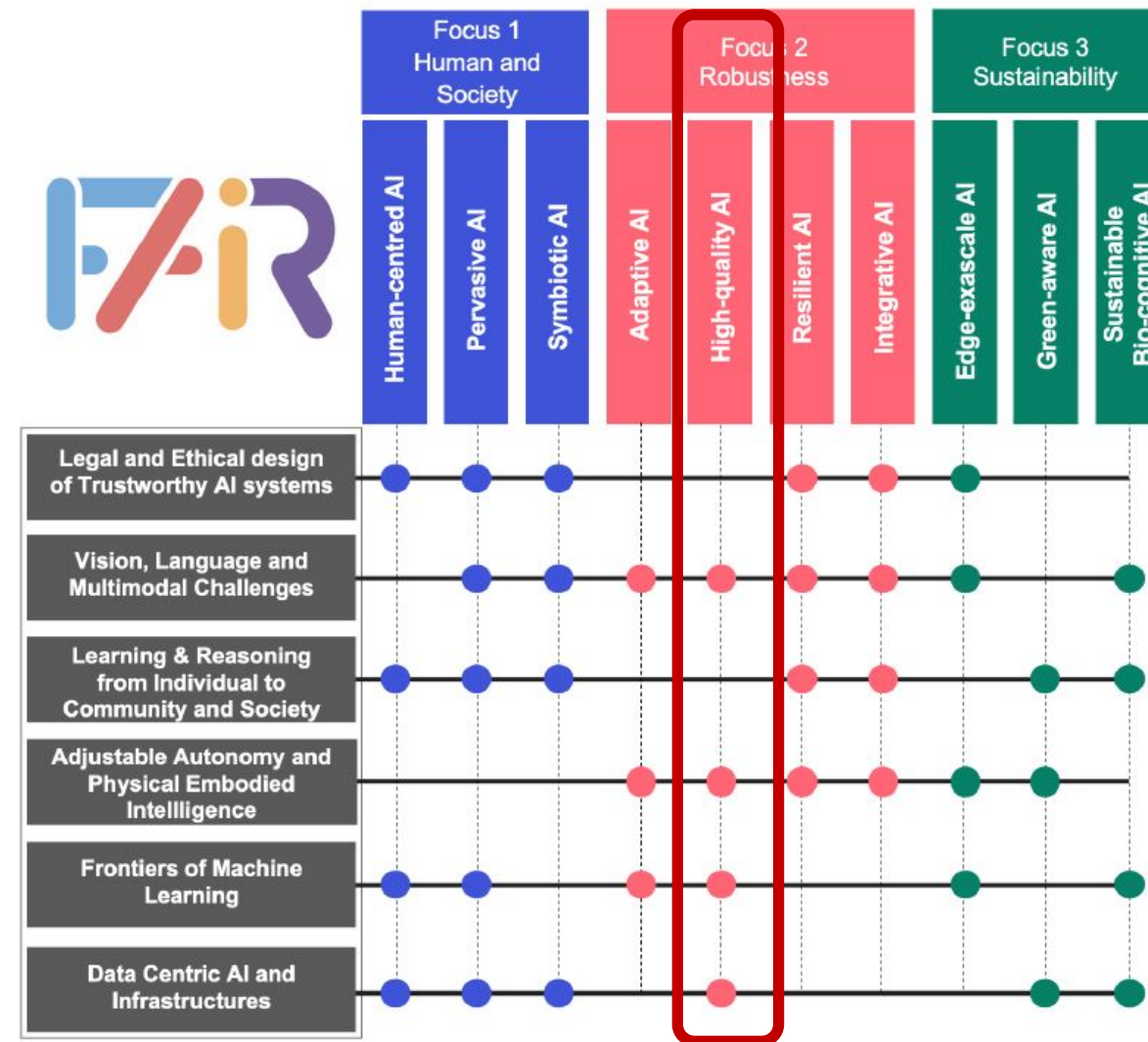


## WP structure

- WP5.1 – Scientific, Methodological and Ethical Foundations for Verifiable **Adjustable Autonomy**
- WP5.2 – Data Quality and Management in **Data-Centric AI**
- WP5.3 – Quality in **AI Physical Systems**
- WP5.4 – **Natural Language Generation** and Text Quality Assessment
- WP5.5 – Quality Assessment in **Hard Science and AI**
- WP5.6 – Engineering and Scientific Qualities in **Machine Learning**
- WP5.7 – Mathematically-Grounded Qualities of **Transparent and Accountable AI** Models
- WP5.8 – **Pilots and case studies** for High-Quality AI validation and demonstration

# Collaboration

- Spoke scientific meetings
- Transversal Projects
- Cascade calls
  - Academy
  - Industry
- International community





# Impact

- **AI scientific community:** measuring and assessing AI quality becomes a major topic in AI conferences
- **Other scientific communities (SSH):** collaboration to measure and assess human-related qualities of AI systems
- **Citizens:** improved understanding and trust in AI systems
- **Public/regulamentary bodies:** certification methods and support for regulatory actions
- **Industry:** new processes and business models for AI systems



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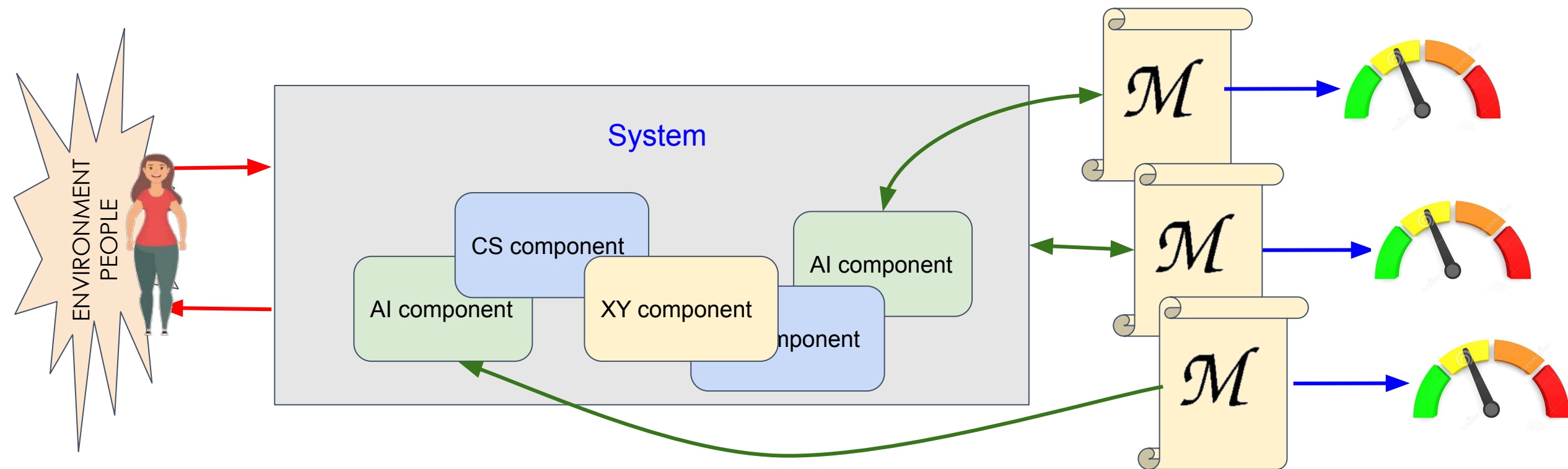
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# Thank you for your attention



# High-quality AI Methodology

- System-level and AI-Component level



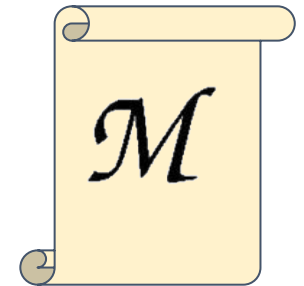


# Research questions

**Q5.1** *“Which formal, mathematical, and ethical guarantees should AI systems that deliberate their actions autonomously have”*

- foundational aspects
- application to physical systems and robots

Addressed in **WP5.1**, **WP5.3** and **TP4**



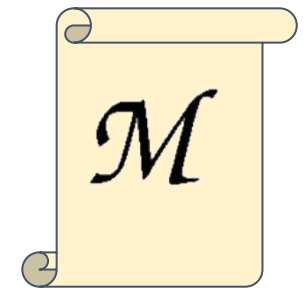


# Research questions

**Q5.2** “How to assess Data Quality and how to manage data to preserve high quality standards in Data-Centric AI Systems”

- formal, mathematical, engineering, and scientific qualities
- certifications for data and manipulation processes

Addressed in **WP5.2** and **TP7**



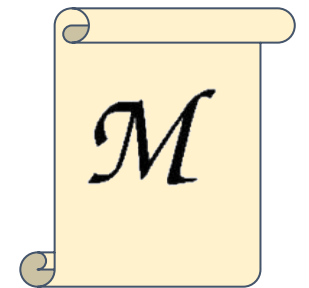


# Research questions

**Q5.3** *“How to assess the qualities of machine-generated/ human-created natural language text”*

- qualities concerned with form and content
- social and ethical aspects (including biases)

Addressed in **WP5.4** and **TP2**





# Research questions

## Q5.4 *"How to assess qualities of AI systems based on Machine Learning"*

- foundational mathematical guarantees
- engineering and scientific qualities
- quality assessment in the Hard Sciences

Addressed in **WP5.5**, **WP5.6**, **WP5.7** and **TP5**

