Industrial challenges of AI deployment in critical systems

Loïc CANTAT – IRT SystemX

Adra session: towards shared R&I tools and platforms for automotive and mobility
23th Novembre 2022
Making France one of the leading countries in artificial intelligence for industry

**NORMS PILLAR**
Norm, standard and regulation environment toward certification

**TECHNOLOGICAL PILLAR**
Design, deploy and maintain AI-based critical systems

- Industry strongly involved in programs, especially AI Manifesto members.
- Cooperation with French basic research Initiatives, such as Aniti or DataIA, and academic research.

**APPLICATION EVALUATION PILLAR**
Ensure the right operational exploitation

Securing, certifying and enhancing the reliability of AI-based systems
AI Engineering: a national strategy at the service of French industry

Provide industrial companies with solutions that enable them to develop new critical products and services based on trustworthy AI.
Multi-technology, multi-domain, multi-engineering

AI Scope
- Data driven AI
- Knowledge based AI
- Hybrid AI
- Distributed & Embedded AI

AI Engineering
- Data Eng.
- Knowledge Eng.
- Algorithm Eng.
- System Eng.
- Safety/Security Eng.
- Human Factors

Industrial Domains
- Automotive
- Aeronautics
- Defense
- Energy
- Manufacturing
- Others
- Health Railway...
Focus on the scientific challenges

**TRUST AND SYSTEMS ENGINEERING WITH AI COMPONENTS**
- Global Approach to Trustworthy AI Components
- Building Trustworthy AI Components
- Qualifying AI-based components and systems
- Embeddability of AI

**TRUST AND HUMAN INTERACTION**
- User interaction - AI-based system
- Designer/certifier interaction - AI-based system

**TRUST AND LEARNING DATA**
- Global approach to data/knowledge for learning
- Building data/knowledge for learning
- Qualifying data/knowledge for learning
FEDERATIVE ENVIRONMENT, METHODS, TOOLS AND USE CASES

- Data and knowledge
- Design
- Evaluation
- Embedded systems

Open / Interoperable / Maintained

QUALITY ASSURANCE – ENGINEERING
An incremental roadmap validated by industrial use-cases

TIME SERIES DATA
IMAGES & VIDEO

USE CASES
• camera-based scene understanding
• Plant demand prediction
• aerial photo interpretation
• visual industrial control
• airborne collision avoidance for unmanned aircraft systems

TEXT, AUDIO
DOMAIN KNOWLEDGE

USE CASES EX.
• Anomaly detection
• Opinion mining
• Decision making
• Ontology management

SYSTEM APPROACH,
SAFETY DEMONSTRATION

USE CASES EX.
• Autonomous vehicle
Quality management

Annual batch delivery of integrated technological and methodological components to be transferred to the consortium' industrial partners
### Use cases overview

<table>
<thead>
<tr>
<th>Theme</th>
<th>Primary</th>
<th>Secondary</th>
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<tbody>
<tr>
<td>2D Vision</td>
<td>Scene understanding (Valeo)</td>
<td>Aerial pictures (Thales LAS)</td>
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<tr>
<td>Visual inspection</td>
<td>Welding inspection (Renault)</td>
<td>Industrial control (Safran)</td>
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<td>Time series prediction</td>
<td>Demand forecasting (Air Liquide)</td>
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<tr>
<td>Time series anomaly detection</td>
<td>Plant efficiency monitoring (Air Liquide)</td>
<td>Virtual sensor (Airbus Helicopter)</td>
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<td>Tabular data</td>
<td>ACAS XU (Airbus)</td>
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<td>NLP</td>
<td>Opinion mining (Renault)</td>
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<td>Hybrid ML Symbolic</td>
<td>Time dependent planning (Safran)</td>
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<td>Visual similarity</td>
<td>Re-identification (ATOS)</td>
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Partners joining forces

LARGE GROUPS
- Air Liquide
- AIRBUS
- Atos
- NAVAL GROUP
- Renault Group
- SAFRAN
- Sopra Steria
- Thales
- Valeo

RESEARCH ORGANIZATIONS/UNIVERSITIES
- CEA
- CNRS
- CRISTAL
- ENSTA ParisTech
- LIP6
- INRIA
- LITIS
- UBS

STARTUP / SME
- APSYS
- air
- AVIDENCE
- Azure
- CoralVista
- Daftalab
- Goleam
- Jaybrain
- KereVal
- MAPS
- Mynautics
- SIMSOFT INDUSTRY
- IEEE
- HI! PARIS
- SCAI

STANDARDS, NORMES
- ANITI
- CNRS
- EUREKA
- HI! PARIS
- SCAI

ECOSYSTEM

SUPPORTS
- TRAMC
- LINKS
- FRANCE
- DGA
- ANR
- BPIFRANCE
AI standards and certification landscape

- **NATO (STANAG)**
- **IEEE 7000s**
- **SC27**
- **SC42**
- **WG13 Trustworthiness Characteristics**
- **Al Act**
- **ISO-IEC JTC1**
- **CEN-CENELEC (JTC21)**
- **AFNOR Commission de Normalisation IA**
- **DIN-DKE Commission de Normalisation IA**
- **BNAé**
- **Confiance.ai**
- **Pillier 3 – Stratégie de standardisation**
- **Grand Défi National (Sécurisation et Certification de l’IA)**
- **ETSI**
- **WG7: High level specs metrics/controls for trustworthiness in AI**
- **WG8: AI risks catalogue & risk assessment**
Key figures

- **Duration**: 4 YEARS
- **Large industrial groups**: 9
- **Research centers**: 4
- **Thematic projects**: 7
- **FTP involved over 4 years**: +300
- **Sites: Paris-Saclay and Toulouse**: 2
- **Budget**: 45 M€
- **Associate partners (laboratories, SMIs, startups)**: 12