RE4AI & AI4RE

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What is so different about Ai Systems?

Understanding AI System Requirements

Functional Requirements

Data processing: collect i/p data, data transform, cleaning..etc
Model behavior: train, validate, deploy, predict, classify, cluster.
Decision making: provide recommendations or actions
User interaction: allow users to i/p data, configure parameters.
Output goals: generate o/p in a user-friendly way.

Non-Functional Requirements

- **Explainability:** Transparency and interpretability of AI decisions.
- Accuracy, efficiency, latency, robustness, fault tolerance, data protection., compliance, adaptability and domain transferability.
- **Performance:** Trade-offs between speed and accuracy
- **Reliability:** Robustness in handling uncertainty and edge cases

What would be the major challenges facing RE4Ai?

Challenges in RE4AI

- Evolving Expectations
- Measurement Challenges
- Data Dependency
- Handling Uncertainty

Elicitation Techniques for AI Systems

Some Standard Methods

Interviews, workshops, …etc
However, tailor for Ai,

Scenario-Based Elicitation

Develop use cases to capture requirements for training, validation, and production stages. Use “what-if” scenarios

Data Driven Elicitation

Collaborate with stakeholders on identifying available data sources, and their quality. Data collection, and EDA.

Iterative Prototyping

Create prototypes to gather feedback from stakeholders. Iterate and refine the prototypes to meet the requirements.

Specification of AI Requirements

1. Specify training data and algorithms needed for the AI system.
2. Define system interaction and interfaces for users and other systems.
3. Outline how the AI system integrates with existing systems and infrastructure.

Validation and Verification of AI Requirements

1

Falsification

Search for values that make the system fail. Ex. Edge values.

2

Simulations and Testing

Conduct simulations and sandbox testing to evaluate AI system performance in controlled environments.

3

Model Testing

Utilize techniques like cross-validation and split-testing to evaluate model accuracy and performance.

4

Probabilistic Verification

algorithm mathematically model the likelihood of failure which helps understand the failures and reliability under uncertainty.

Find out about Verification of learning systems and Robustness testing for Ai Systems

Case Study: AI-Based Healthcare Diagnosis

Trends in RE4AI

1

Ethical Frameworks

Ethical guidelines and frameworks are increasingly important in RE4AI.

2

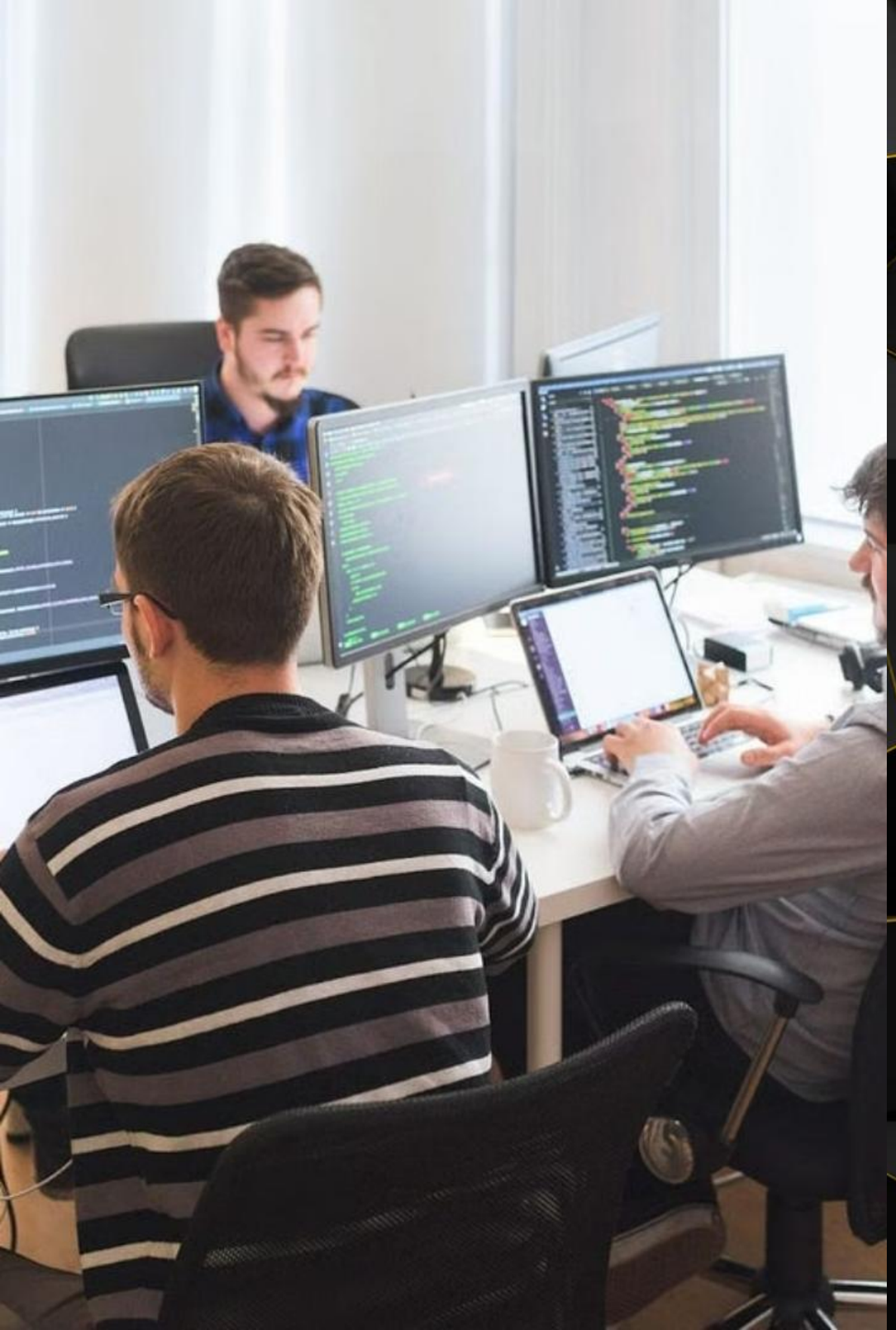
AIOps

Integration of AI with DevOps practices is becoming increasingly common.

3

AI-Powered RE

Using AI to support requirements engineering tasks, such as automatic extraction and prioritization.



AI for Requirements Engineering (AI4RE)

Enhancing Software Development

Applications of AI in Requirements Engineering

Requirements Elicitation

1. **AI chatbots** can facilitate interactive elicitation, gathering requirements from stakeholders in a conversational manner. Sentiment analysis helps identify stakeholder priorities and emotional reactions.
2. **AI-powered tools** can extract requirements from various sources, including documents, emails, and meeting transcripts.

Requirements Analysis

1. **AI algorithms** can detect inconsistencies, ambiguities, and conflicts within requirements.
2. **Analyze historical data** and stakeholder inputs to prioritize requirements based on impact and urgency.
3. **Cluster and categorize requirements** using ML, aiding in their organization and understanding.

AI Techniques for Requirements Engineering

Natural Language Processing (NLP)

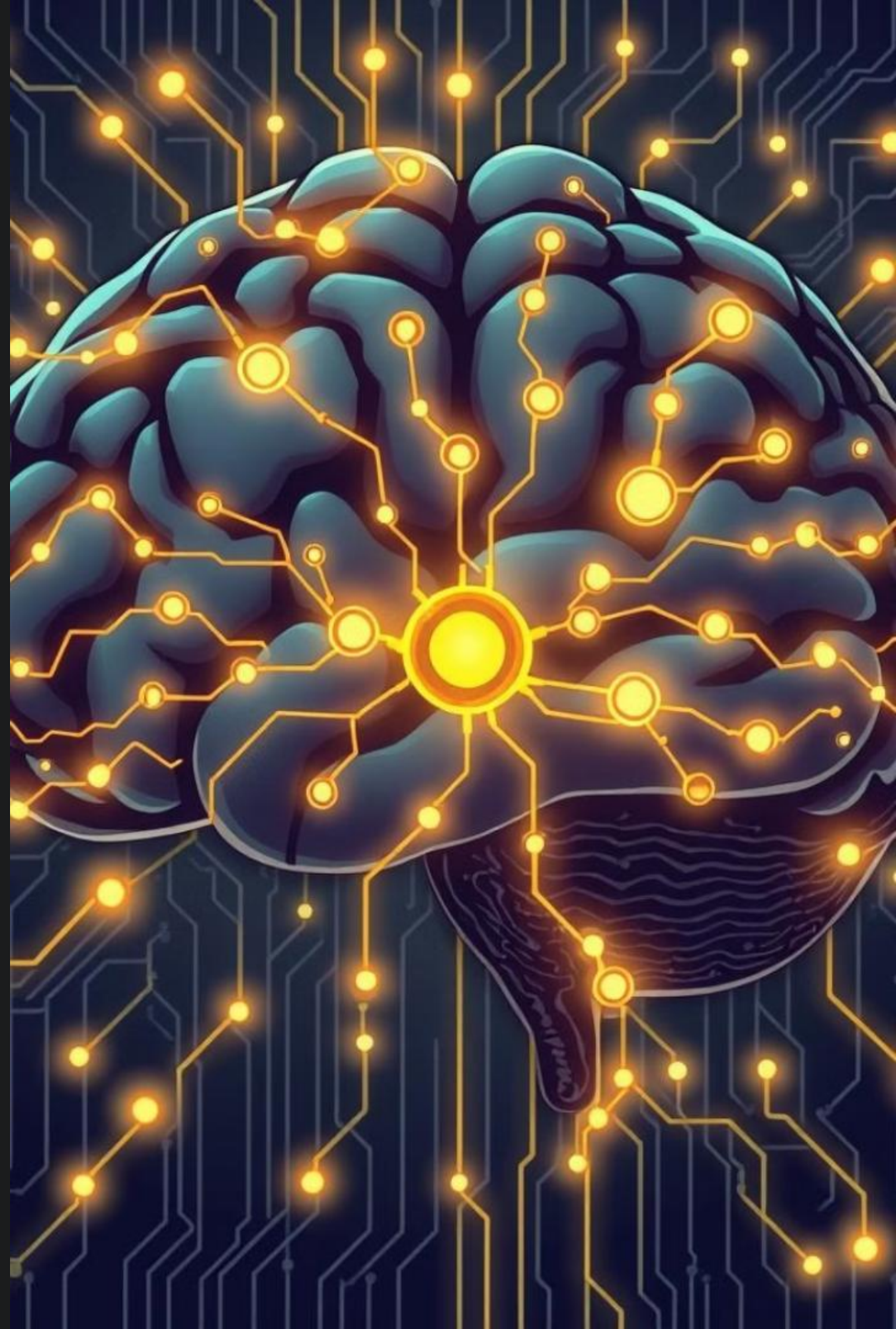
NLP techniques enable AI to extract requirements from unstructured text, identify keywords, understand dependencies, and pinpoint ambiguities. It plays a crucial role in converting textual requirements into structured formats.

Machine Learning (ML)

ML algorithms learn from historical projects to predict requirement categories. They can classify and cluster requirements based on patterns and similarities, providing insights for better organization and prioritization.

Knowledge Representation and Reasoning

Ontologies are used to represent domain knowledge, while AI-driven reasoning allows for consistency checks and impact analysis. These techniques ensure the accuracy, completeness, and coherence of requirements.



Challenges of AI4RE

Data Quality

Interpretability

Ethical and Privacy Concerns

Integration and Workflow

Trends in AI4RE

1. **Generative AI models,** like GPT, are used to draft requirements and user stories, streamlining the initial stages of requirements development.

2. **AI-powered tools (ex, JIRA)** are being developed to facilitate collaborative requirements engineering among remote teams,. Enable smarter backlog management and efficient prioritization

3. AI for adaptive requirements engineering (RE4AI)

Thank You