Ciencia y Tecnología
Secretaría de Ciencia, Humanidades, Tecnología e Innovación

Transformación Digital
Agencia de Transformación Digital y Telecomunicaciones

Inteligencia Artificial de Operaciones: Aplicación de la inteligencia artificial y optimización matemática para las cadenas de suministros y logística

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Digital Transformation

Challenges

Background

Situation

- (**6.84 billion**):

Information Technologies are at the heart of any business.

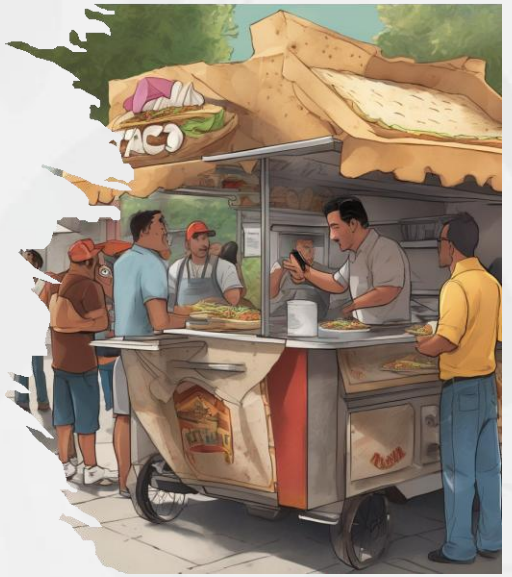
(**90%**) :

- Most of business data is unstructured.

(**Too many manual process**):

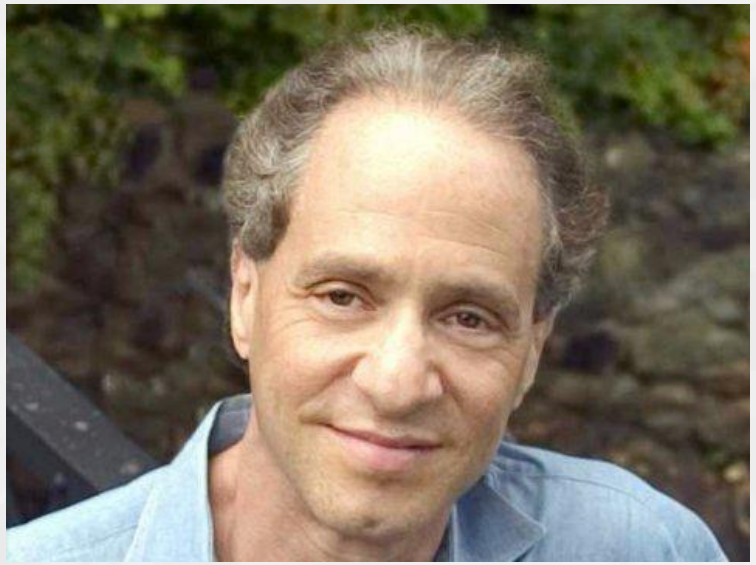
- Businesses are inefficient, slow, and inflexible.

Inefficiencies lead to low demand fulfillment and low resource utilization.



AI Singularity

Futurist Ray Kurzweil, MIT



The Law of Accelerating Returns:

- “the rate of change of technologies tends to increase exponentially”.

Critical Challenge for AI

Proper Adoption

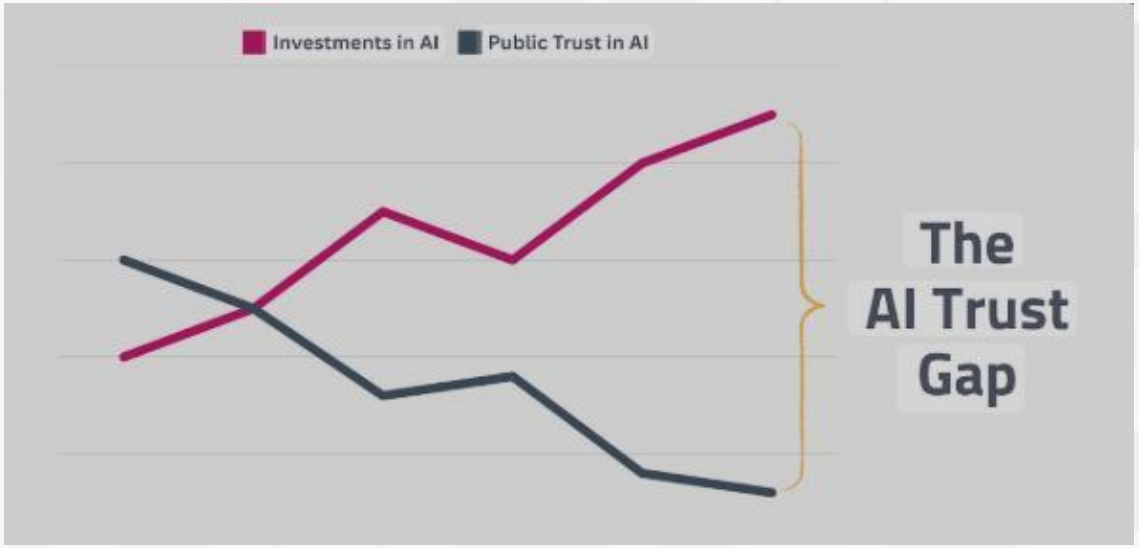
What is the social value of a technology if it is not adopted?

- The main problem with the AI technology adoption is that people does not trust it.
- The second problem is the AI technology needs to be used **properly**.

Proper use of AI:

- Effectively
- Efficient
- Ethically
- Responsible

The AI adoption gap could lead to significant social, economic, and political challenges.



Operations Artificial Intelligence

OperAI

Operations Artificial Intelligence

(OperAI): What is it?

OperAI: Addressing the Challenges of Digital Transformation:

- Transforms unstructured data into structured data enabling advanced analytics
- Enables optimal decision making.
- Business process automation.

OperAI Applied Research :

- Multi-disciplinary approach that helps a business discover, design, build, and deploy AI/OR applications that maximize its operational efficiency while optimizing several trade-offs of its business objectives as well as satisfying resources and business constraints.

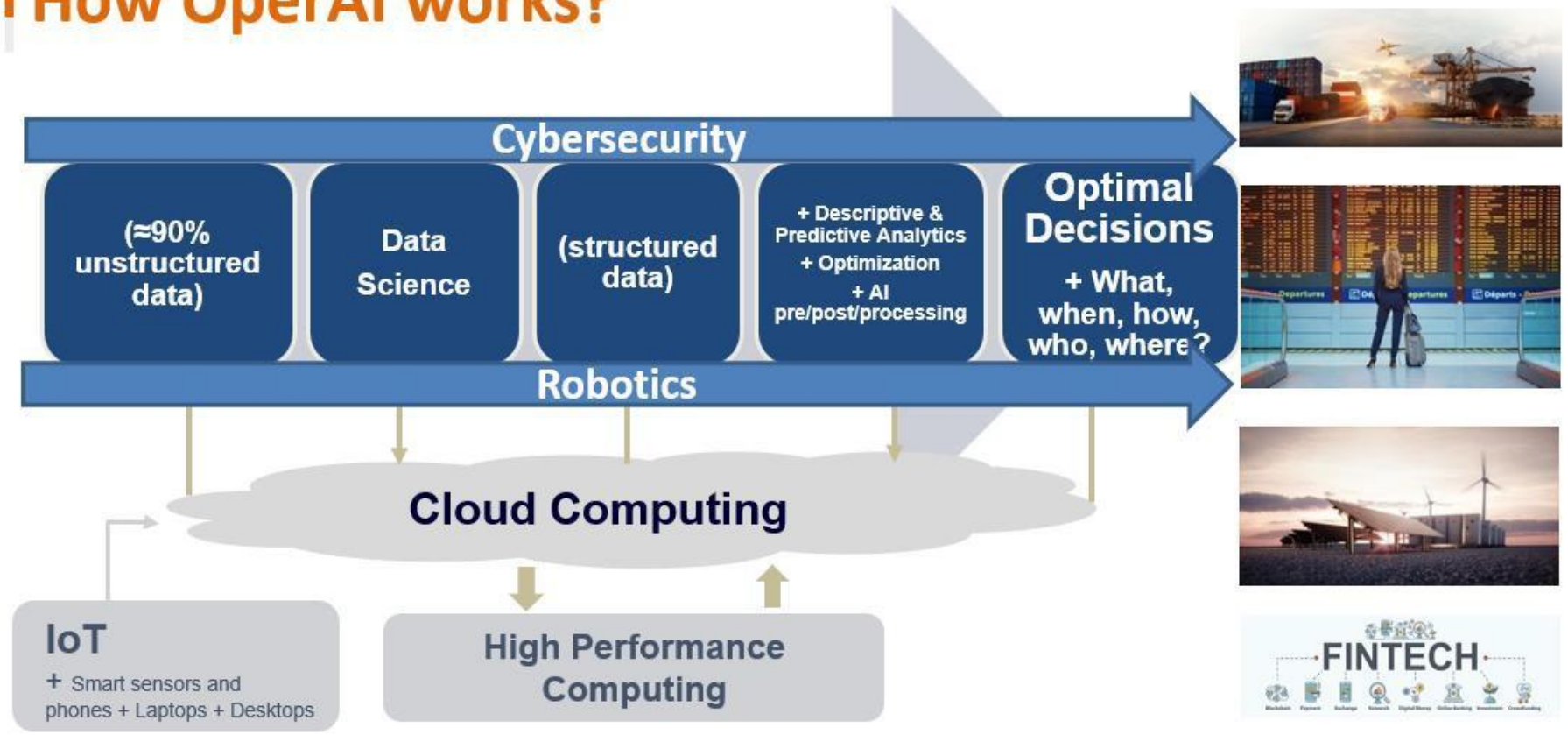
Operations Artificial Intelligence

(OperAI): What is it?

OperAI disruptions and implications:

- IoT ➔ Data.
- Robotics ➔ Enhancing human sensor/motor capabilities.
- Cloud Computing ➔ Access to HPC.
- LLM ➔ Access to all human knowledge.
- Descriptive/Predictive/Prescriptive Analytics ➔ Optimal decision making.
- All of the above ➔ Lean organizations and democratization of capital.

How OperAI works?



Operations Artificial Intelligence Applications

Optimized data driven decision making

Opportunities Regional and National Governments

OperAI

Supply Chain and Logistics for Public Services. **AI enhances forecasting accuracy for** public service demand (e.g., food programs, **public health supplies**), while **optimization models ensure the efficient delivery of goods to rural and urban centers**.

Education and Workforce Development. **AI can predict skills in demand** for the future **labor market**, while optimization techniques help **governments allocate funds for training programs that best meet regional economic needs**.

Policy Making and Economic Planning. **AI models can simulate the effects of various tax policies** on different economic sectors and social groups, while **mathematical programming helps optimize tax structures to balance government revenue with economic growth and fairness.**

Healthcare Resource Allocation. AI-driven demand forecasting and optimization models can design efficient distribution networks for services, ensuring that the right quantities are delivered to the right locations in a timely manner, minimizing wastage.

Energy and Utilities Management. AI can model water demand patterns and predict shortages, while mathematical optimization can allocate water efficiently across agricultural, industrial, and domestic users, especially in drought-prone regions.

Public Safety and National Security. AI models analyze crime patterns and predict future incidents, while optimization algorithms help in the optimal deployment of law enforcement resources across regions to maximize deterrence and response effectiveness.

Operations Artificial Intelligence

Last words

Laboratorio Nacional de Inteligencia Artificial

Retos

Manejo de Proyectos:

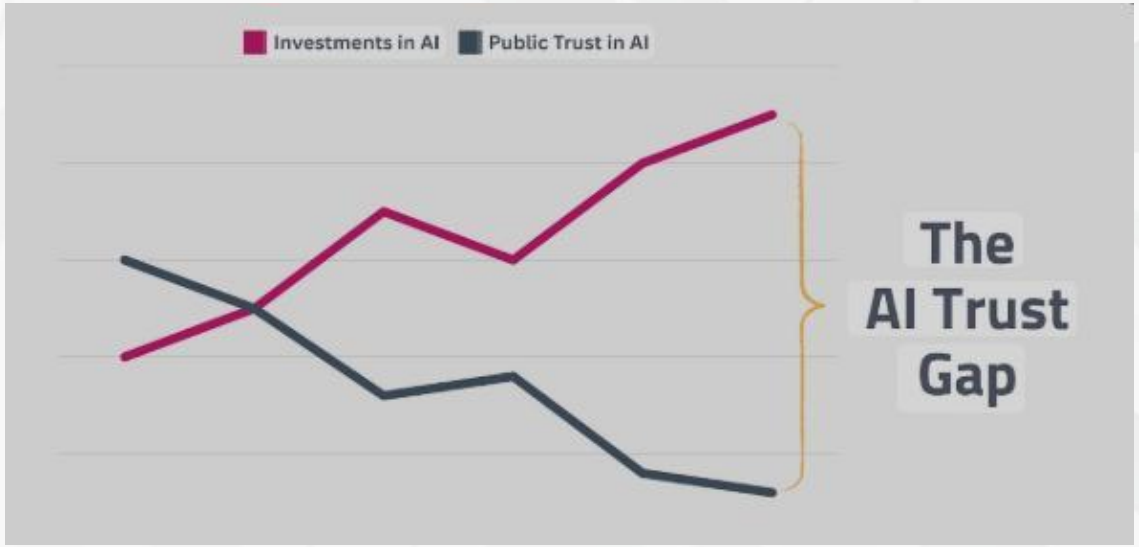
- Que proyectos hacer?
- Que proyectos no hacer?
- Que proyectos dejar de hacer?

Asignación de Recursos humanos :

- Cual debe ser el perfil de los recursos a asignar a cada tarea de un proyecto?
- Como medimos objetivamente si un recurso esta calificado para una tarea?

Investigación de IA Aplicada:

- Que no exista una aplicación similar.
- Desarrollar prototipos como pruebas-de concepto que puedan ser usados por un experto en el dominio de la aplicación.



Operations Artificial Intelligence

Q&A

Seed Questions

Panelists

Bridging the "AI Trust Gap": The presentation highlights the "AI Trust Gap" as a critical challenge. Beyond technical robustness and achieving stated efficiencies, what specific, proactive strategies (e.g., transparency initiatives, public education, participatory design) does Guapo Analytics or the government agencies envision to build and maintain public and organizational trust in OperAI, especially when its decisions have significant real-world consequences in areas like public service delivery or safety?

OperAI in Dynamic Supply Chains : For supply chain and logistics, OperAI aims to optimize complex systems using AI and mathematical optimization. Could you elaborate on how OperAI specifically addresses the challenge of integrating and acting upon real-time, often volatile, and disparate data streams (e.g., IoT sensor data, sudden geopolitical disruptions, LLM-derived sentiment analysis) to enable truly adaptive and resilient decision-making, rather than just optimizing based on historical or slowly changing structured data?

Seed Questions

Panelists

Ensuring Equitable "Democratization of Capital" : Slide 8 mentions "democratization of capital" as an implication of OperAI. How can a sophisticated system like OperAI, which likely requires significant expertise and initial investment, genuinely empower smaller businesses or under-resourced public entities, preventing a scenario where its benefits primarily accrue to large organizations that can more easily adopt and leverage such advanced technologies?

Managing Ethical Considerations in "Optimal Decisions": OperAI promises "Optimal Decisions" across various sectors, including sensitive areas like healthcare resource allocation and public safety. What ethical frameworks and safeguards are embedded within OperAI's design and deployment process to ensure these "optimal" decisions are also fair, equitable, and avoid perpetuating or amplifying existing biases present in historical data?

Seed Questions

Panelists

From Unstructured Data to Actionable Intelligence: Given that approximately 90% of business data is unstructured, and OperAI aims to transform this into structured data for advanced analytics, what are the key innovations or methodologies within OperAI's "Data Science" component that enable it to effectively extract meaningful, reliable insights from diverse unstructured sources (text, images, etc.) at scale, and how does it ensure the quality and relevance of this transformed data for subsequent optimization?

Operations Artificial Intelligence

Backup Slides

Opportunities for Industry

OperAI

Supply Chain Optimization. **AI-powered models predict demand fluctuations**, which can then feed into mathematical programming models to **optimize inventory levels**, **production schedules**, and **distribution strategies**.

Manufacturing. **AI can detect anomalies in product quality** by analyzing data from sensors or production lines and identify the root causes of defects . **Mathematical optimization** can be used to **prescribe optimal interventions**.

Retail. **AI models can predict customer behavior**, **competitive pricing**, and demand elasticity. Mathematical programming can **optimize pricing** strategies to **maximize revenue** while **maintaining market competitiveness**.

Agriculture. AI analyzes weather, soil conditions, and historical crop yield data, while mathematical programming helps farmers optimize planting schedules, resource usage (e.g., water, fertilizers), and harvesting plans to maximize yield and profit.

Finance. AI detects patterns in transaction data indicative of fraud, and optimization models help manage risk by adjusting credit limits, optimizing cash reserves, or allocating resources for fraud prevention.

Energy and Utilities. AI can forecast renewable energy production (from sources like wind or solar), and mathematical programming can optimize the energy mix to meet demand while balancing costs and reducing emissions.

Subtítulo

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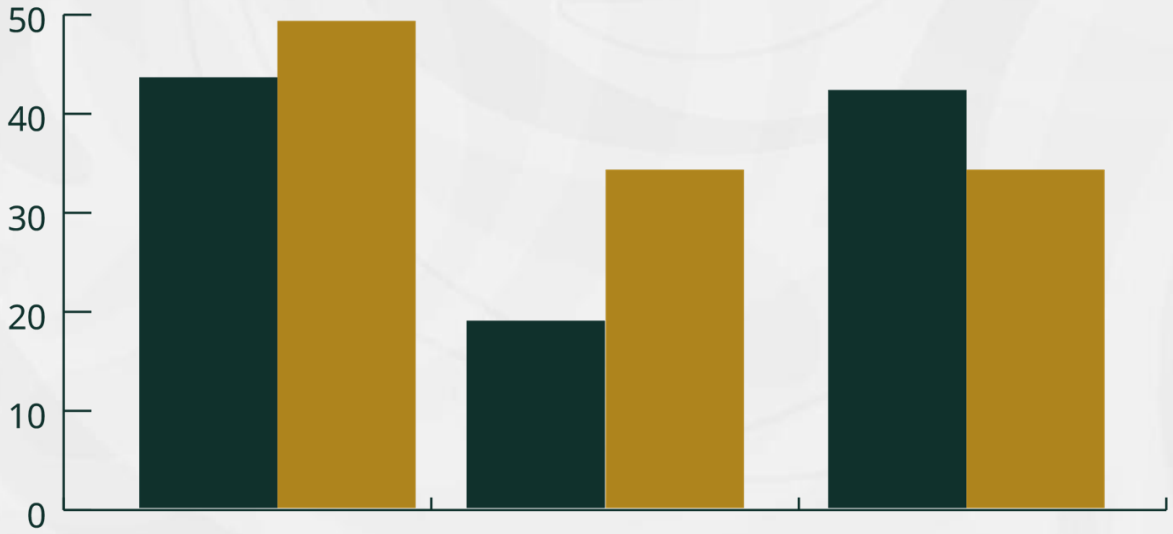

(BORRAR)

RECUADRO PARA TRADUCCIÓN DE SEÑAS