Mexico Research Project:

Operational Use of EO Data for Agricultural Statistics

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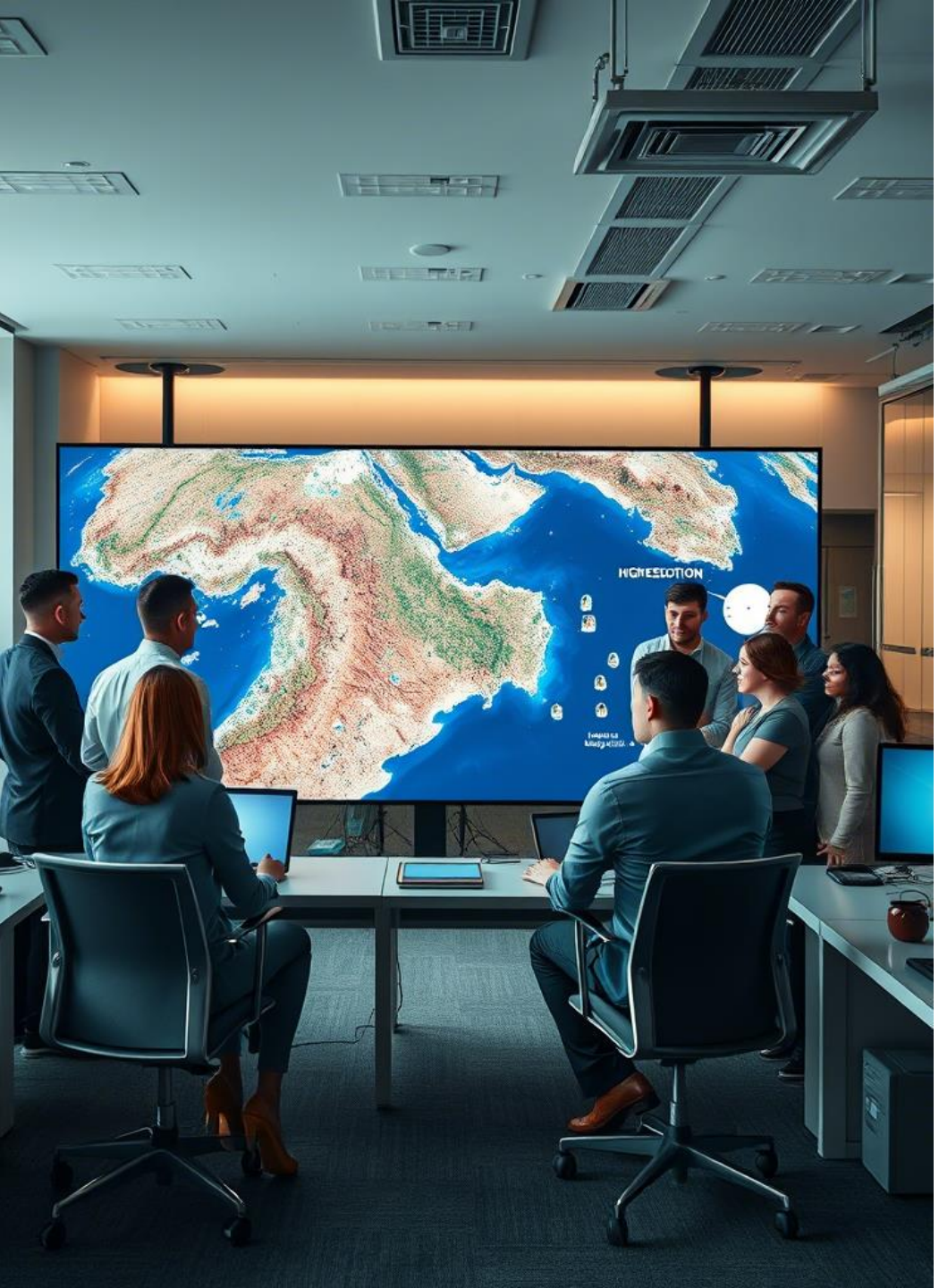

Project Overview & Collaborative Innovation

- **Objective:** Enhance agricultural census accuracy using EO data and advanced machine learning.
- **Collaboration:** INEGI's Data Science Laboratory in partnership with Regional & Economic Statistics teams.
- **Tech Stack:** Hybrid cloud/on-prem infrastructure (160-core cluster, 45 TB NAS).
- **Scope:** Pilot study focused on Sonora's industrial agriculture (2018–2019 season).
- **Tutorial:** Open-source pipeline available on GitHub for reproducibility and capacity building.

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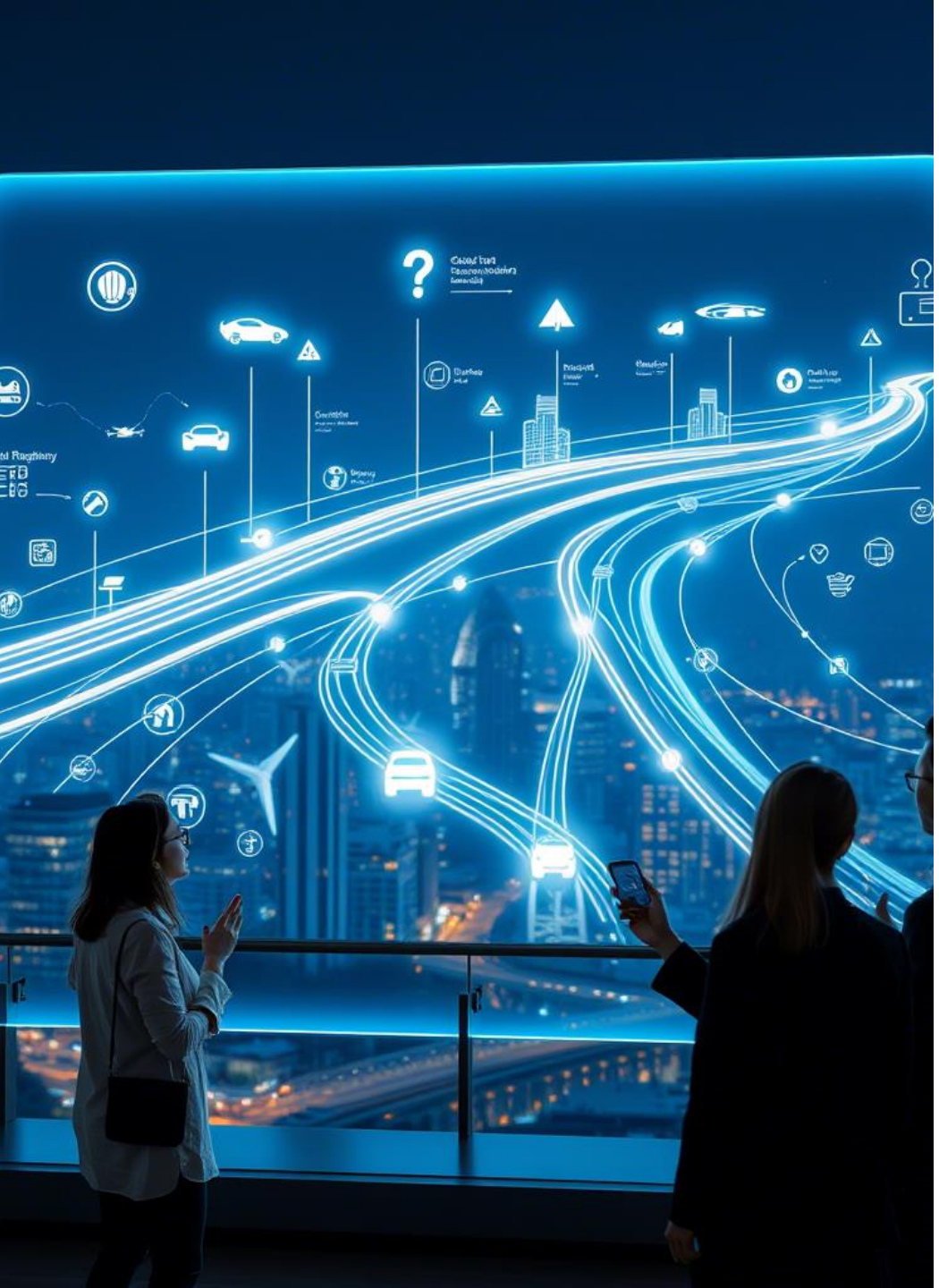
Methodology, Initial Results & Capacity Building

- **Image Segmentation & Feature Engineering:**
  - Use Shepherd Segmentation for object-based crop parcel delineation.
  - Extract NDVI/EVI, radar backscatter, and statistical metrics per segment.

- **Data Integration & Operational Workflow:**
  - Integrate optical (Sentinel-2), radar (Sentinel-1), and Landsat data for comprehensive crop characterization.
  - Utilize a streamlined pipeline documented in a Jupyter Notebook—from preprocessing to model training.

- **Initial Results & Insights:**
  - Achieved approximately 77% weighted accuracy with ensemble models (MLP + ExtraTrees).
  - Strong differentiation of cultivated vs. non-cultivated areas; minority crops remain challenging due to data imbalance.

- **Capacity Building & Knowledge Sharing:**
  - This methodology is a foundational step in training our team in Python and Data Science.
  - Lessons and processes are shared through an English tutorial to support future operational improvements.



Next Steps, Open Collaboration & Future Impact

- **Expansion Plans:**
  - Scale methodology to diverse regions (smallholder farms, tropical zones) and additional crop types.
  - Integrate temporal analysis using full time series data from EO.
- **Optimization Strategies:**
  - Leverage AutoML for enhanced feature selection and hyperparameter tuning.
- **Capacity Building:**
  - Ongoing training in Python and EO data processing to foster collaboration and innovation.
- **Open Collaboration:**
  - Access and contribute to the full tutorial and code repository on GitHub: https://github.com/abxda/crop-classification-tutorial

¡GRACIAS!

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