Colombian-Quebec challenge in artificial and computational intelligence for a better future

Défi colombo-québécois en intelligence artificielle et computationnelle pour un avenir meilleur

Catedra Intenacional de Ingenieria - Coopération Québec-Colombie

David L. Alvarez, Ph.D, Prof. Sergio Rivera, Prof. Alben Cardenas

🏛 Universidad Nacional de Colombia

🏛 Université du Québec à Trois-Rivieres

📅 July 30, 2021

AM Challenge

David L. Alvarez

Université du Québec
à Trois-Rivières

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A perfect storm created by aging assets, retiring experts, increasingly engaged stakeholders and rapidly changing technology has triggered the need for increased sophistication and rigor in asset management.
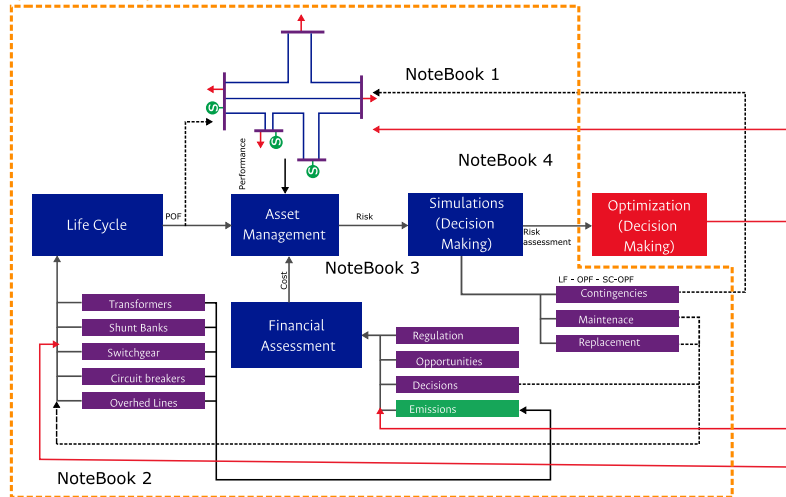
Challenge Objective

To develop an optimal operation strategy and an asset management plan for supporting power asset decision making using data analytic and computational intelligence

Challenge Proposal

Methodology

- ▶ PywerAPM can be download from github after August 01 - 2021, https://github.com/dlalvareza/PywerAPM
- ▶ Reference Jupyter Notebooks will be provided for off-line simulations
- ▶ The main topics will be addressed in the course
- ▶ Three files with the optimal strategy and asset management plan will be submitted before august 16-2021 by the participants

Required information
Network data for criticality assessment

Load Flows, OPF, Contingencies N-POF(N)

Legend: Load — Bus — Line — Transformer — Circuit Breaker — Switch — Auxiliary systems — External grid

Buses and loads labeled: Bus 13, Bus 14, Load CI13, Load CI12, Load R12, Bus 8, Bus 12, Load CI14, Load R14, S1, Load R6, S2, Load CI7, Load CI9, Bus 7, Bus 6, Load R8, Bus 1, Bus 2, Bus 9, Bus 10, Load R3, Load CI1, Load CI3, Load R1, Load R10, Load CI10, Bus 0, S3, Load R11, Bus 3, Bus 11, Load R4, Bus 4, Load R5, Bus 5

Generation legend: Fuel cells, Wind turbine, Photovoltaic, Battery, Combined heat and power

SAIDI, SAIFI, A, Incomes, ENS

Name	S-MVA	N_Users
Load_03	322	64400
Load_04	500	100000
Load_07	234	46760
Load_08	522	104400
Load_12	8	1500
Load_21	274	54800
Load_23	248	49500
Load_24	309	61720
Load_25	224	44800
Load_26	139	27800
Load_27	281	56200
Load_28	206	41200
Load_29	284	56700
Load_31	9	1840
Load_39	1104	220800
⋮	⋮	⋮
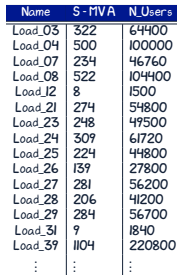
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13	CB_03	6
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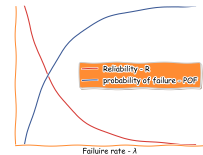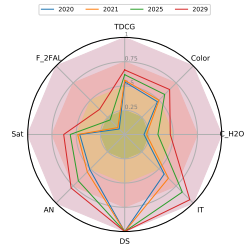
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Required information

Historical asset condition records, failure rates and load forecasting

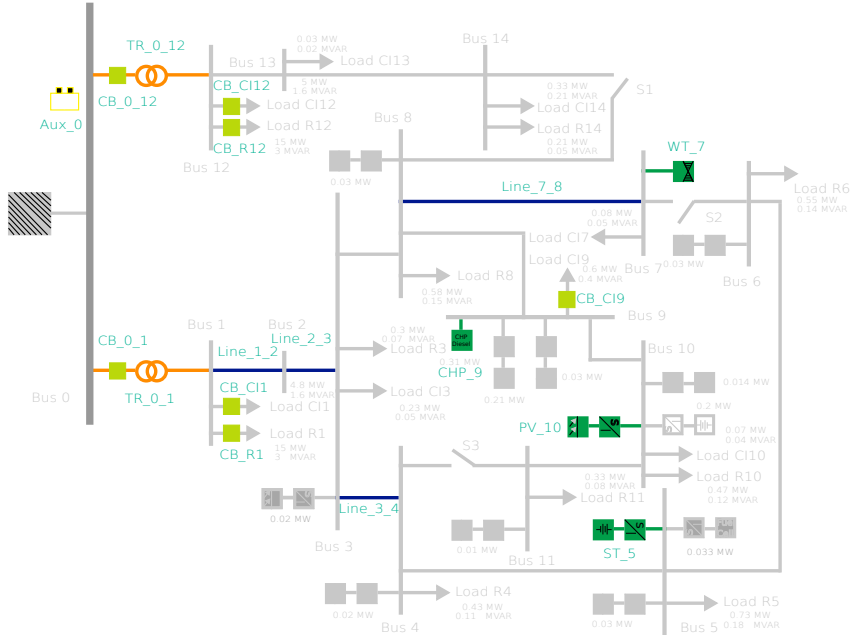### Load forecasting
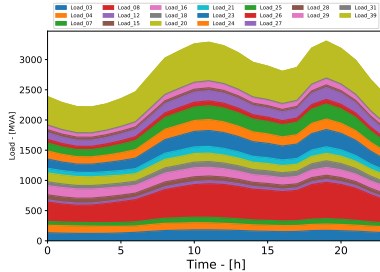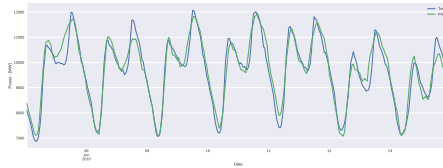
Condition records and failure rates

Asset fleet

- ► .json file describing each strategy during a contingency
- ► .json file with the replacement and maintenance strategy
- ► .excel file with the strategy used for each asset failure

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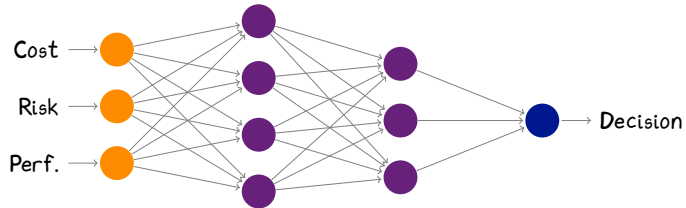- ▶ .excel file with the strategy used for each asset failure

Score Method

Maximum Net Present Value **(NPV)** during the network life cycle **(20 years)** with a rate discount of **13 %**. The maximum investment for year cannot be higher than **90000**
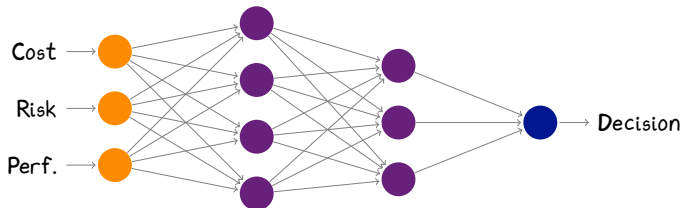
PywerAPM - An open code library

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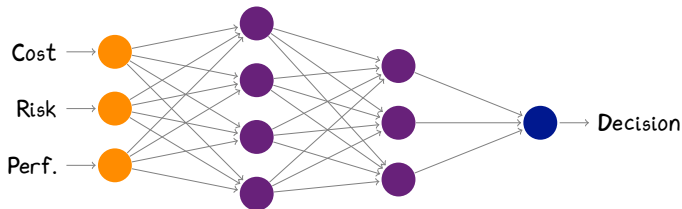

Highlights

- ▶ Open reference framework to support decision Making (Benchmarking)
- ▶ Customization to the user requirements
- ▶ Automation
- ▶ Definition of strategic objectives
- ▶ Collaborative development in good asset management practices

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PywerAPM - An open code library

Modules

▶ Condition

▶ Performance - Criticality

▶ Risk assessment

▶ Optimization (Decisions)

▶ Reports (Dashboard)

Thank you for your attention
Questions?

🏛 Universidad Nacional de Colombia
🏛 Université du Québec a Trois-Rivieres
🏭 Department of Electrical and Electronic Engineering
✉ dlalvareza@unal.edu.co
📞 +57 3014413314