Joao Almeida

Visiting professor at Aalto University for research collaboration in Prof. Fabricio Oliveira's research group

SAL Monday seminar (29 August)

Hi! I am **Joao Almeida**, and I am from **Brazil**

Brazil has **214 million** people that live in **5,570** municipalities and speak **portuguese**.

I live in **Belo Horizonte**, **MG.**

Belo Horizonte has **2,5 million** people.

Belo Horizonte, Minas Gerais (**MG**), Brazil

UF**MG** (*Federal University of* **Minas Gerais**)

UFMG Public university (95 years)

National leadership in research, teaching, extension, and culture in many areas of knowledge.

91 undergraduate courses: **~35,000** students

90 graduate programs: **~14,000** students

3,165 teachers

DEP Department of Industrial Engineering

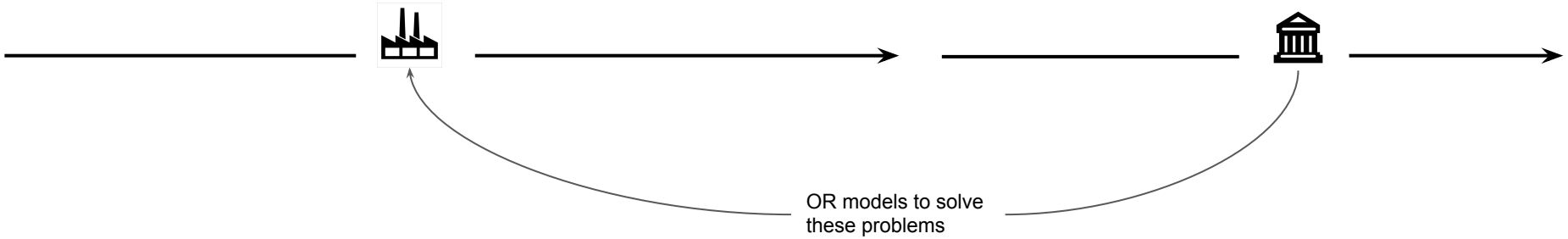
20 teachers, **~400** students. Course **5** years (40+40 per year)

Sub-areas: **Operations Research**, Product development, Quality and manufacturing, Ergonomy, Work organization.

Professional career

Consultant → OR Analyst (PP) → Simulation Engineer → Lecturer → Adjunct Teacher

2005-2006 2009-2011 2011-2013 2014-2016 2016 - today



Research nucleus (5 teachers)

Operations Research

Joao Almeida: Optimization/Simulation for health care systems design and supply chain;

Lasara Fabricia: Stochastic processes, queueing and layout modelling and health care (blood);

Luiz Pinto: Discrete event simulation applied to mining, ports, industries and health care systems;

Ricardo Camargo: Decomposition strategies, scheduling and routing applied to logistics;

Samuel Conceicao: Logistics for steel industries, electronics and MRO strategies.

Projects in Health care systems (I'm trying to help)

2017 - 2018: Planning the location of secondary care in MG (**Secretary of State for Health - MG**)

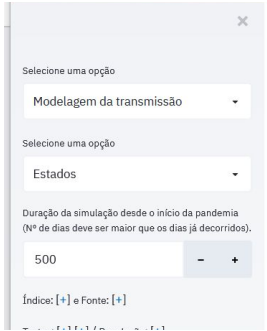
2018 - 2018: Planning and assigning medical specialities capacity for Brazil (**Ministry of Health - Brazil**)

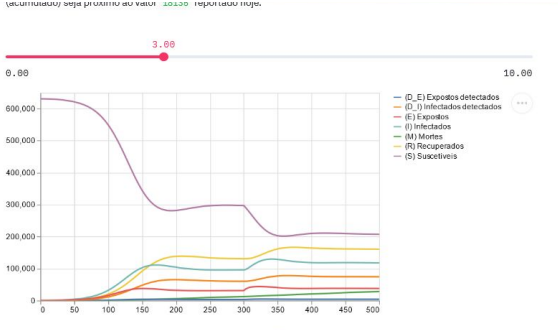
2019 - 2019: Planning equitable accessibility to MRI technology (**Ministry of Health - Brazil**)

2019 - 2021: Parameters for health care planning and hospital global costing (**Ministry of Health - Brazil**)

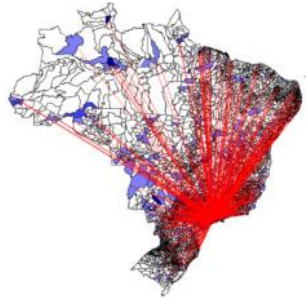
2020 - 2020: Simulation model for hospital beds' requirement on Covid-19 pandemics (**UFMG**) [+]

2021 - : Planning the mass distribution of vaccines (**Research Foundation - MG**)





(a) Distribution of MRIs in Brazil.



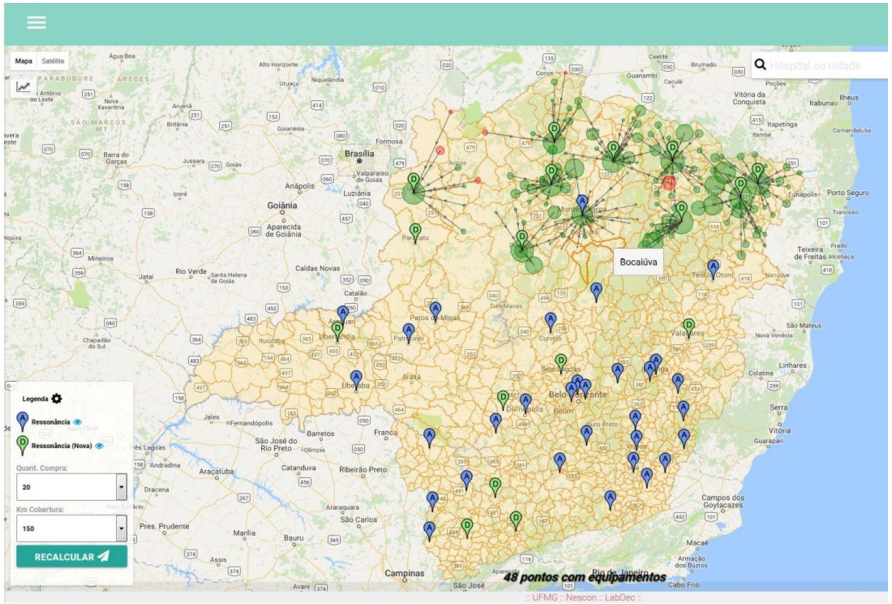
(b) Flow for MRI scan in São Paulo.

Integrated planning for hierarchical health care systems

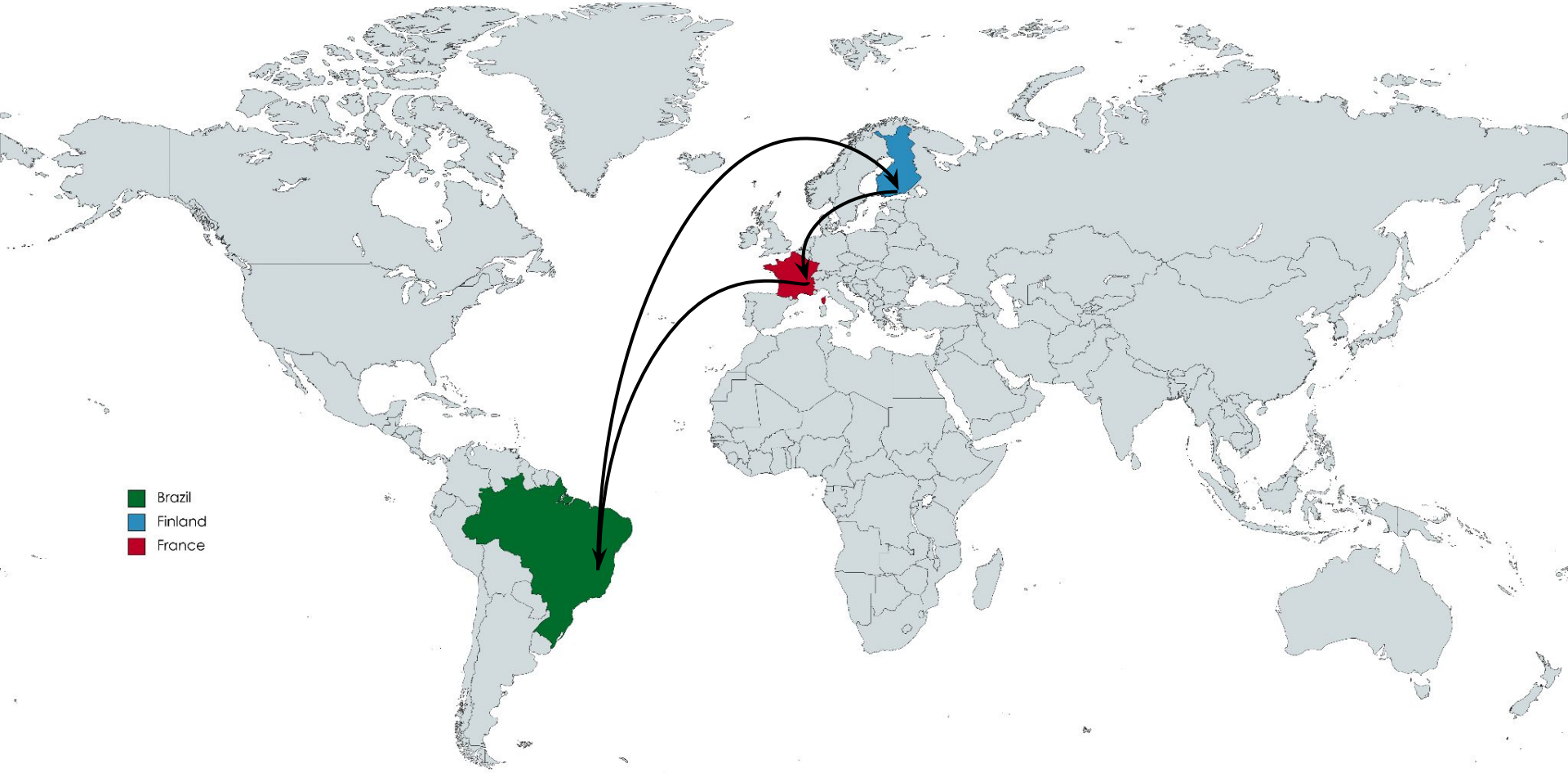
[*using* **Operations Research**]

Health care systems include **primary** (basic care, prevention), **secondary** (diagnosis) and **tertiary** care (hospitals). Such systems can be more effective and efficient when based on a hierarchical design. However, most health care systems don't optimally trade off efficiency and effectiveness on their design.

How benchmark health care systems can contribute to the design of a flexible and integrated system that optimally trades off equity (effectiveness) and costs (efficiency)?



The **research** will explore **Brazilian, Finnish and French** health care systems



Work schedule (6 months in Finland + 6 months in France)

> Motivation and literature review

> Data (sources and extraction)

> Data analysis

> Demand projection model

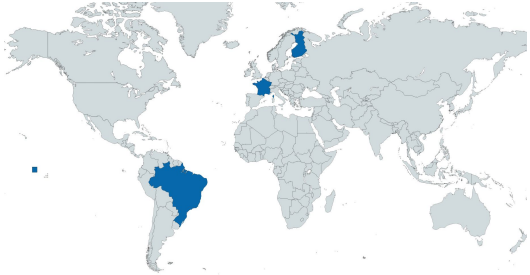
> Hierarchical network design

> Visualization (charts and maps)

> Write paper

Health care indexes	Brazil	Finland	France	Global
Municipalities	5,569	309	34,836	
Regions (states)	26	19	12	
Inhabitants	213,993,000	5,552,550	67,499,000	
Area (km²)	8,515,770	338,450	549,087	
Inhabitants / km²	25.13	16.41	122.93	
Life expectancy of males (years)	73	80	80	71
Life expectancy of females (years)	80	85	85	75
GDP (bn $)	1,608.98	299.16	2,937.47	
Corruption Index	38 (bad)	88 (good)	71 (good)	
Hospital Beds/1000 inhabitants	2.1	3.6	5.9	2.9
Doctors/1000 inhabitants	2.15	3.8	3.23	1.5
Nurse / 1000 inhabitants	7.4	15	11.5	
State expense in HP / inhabitant (% GDP)	9.60%	9.20%	11.10%	1,121.97
Drinking water (% of population)	86.00%	99.64%	99.25%	74.00%
Health funding (public)	42.80%	74.70%	77.00%	

Health care systems

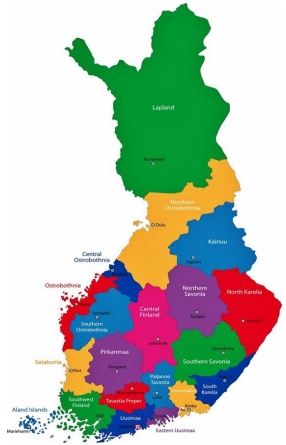


Brazil: The health care system (SUS) is *universal and free for everyone*, but the system is *hospital-centred*.

Finland: Health care system *effectiveness is well above average in a global comparison*, but *health information systems are uncoordinated at the national level*, partly due to the decentralized healthcare system.

France provided the "best overall health care" in the world. The entire population must pay compulsory health insurance. Patients have to pay fees but the global social security system covers 70% of the global cost. But It was reported *higher wait times for some procedures such as MRI scans, perhaps relating to low numbers of scanners*.

Both in Finland and France, the general practitioners act as "*gatekeepers*" who refer patients to a specialist or a hospital when necessary.



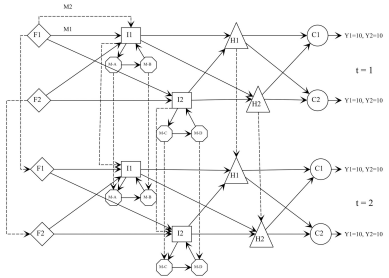
Integrated planning for hierarchical health care services

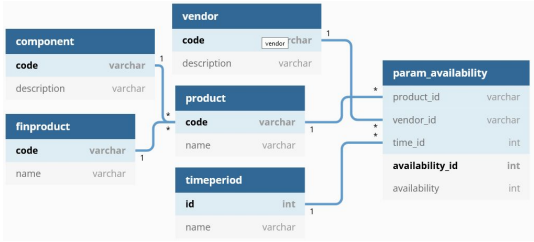
Sales & Operations Planning (S&OP) tool

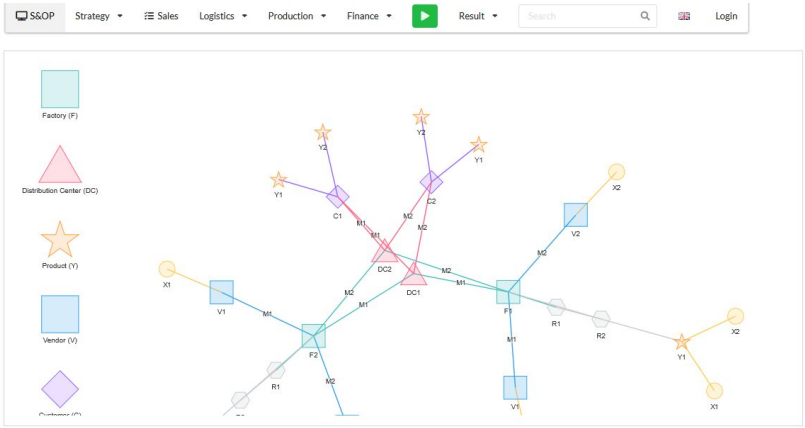
Draft manuscript

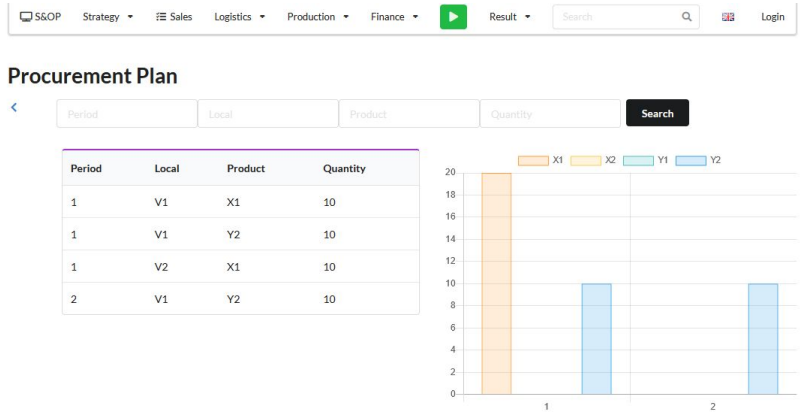
S&OP method is carried out by a team in companies.
On the one hand, there are **sophisticated S&OP systems**, often used by large-scale companies, not affordable for SMEs.
On the other hand (apart from sophisticated S&OP systems), models are developed to be used in **spreadsheets**, which is not a system, nor projected for multi-users.

How can scientists and short IT teams develop a simple and multi-user tool for the S&OP process?









Beyond my researcher profile…

I love my wife, Lygia, my family, my friends

And I like recreational fishing.

Kiitos!

Thank you, Fabricio and all from the Department of Mathematics and Systems Analysis of Aalto University!

References

Maps: https://www.mapchart.net

Belo horizonte: https://pt.wikipedia.org/wiki/Belo_Horizonte

UFMG: https://ufmg.br/ https://pt.wikipedia.org/wiki/Universidade_Federal_de_Minas_Gerais

DEP: https://www.dep.ufmg.br

PPGEP: http://www.pos.dep.ufmg.br/index.php/pt_br/

Health care network design: https://doi.org/10.1590/0103-6513.20190006

Supply chain schema: https://doi.org/10.1371/journal.pone.0194050

SME in Finland: “SMEs in Finland currently account for 59.6% of value added and 65.2% of employment.”

SME in Brazil: “The OECD estimates that SMEs in Brazil are responsible for 62% of employment and contribute 50% of national value added so the digitalisation of the nation's small businesses is likely to have a noticeable impact on Brazil's economy and market size.”

MRIs location: https://doi.org/10.1016/j.dajour.2022.100105