

Industry 4.0

First InPrInt Seminar

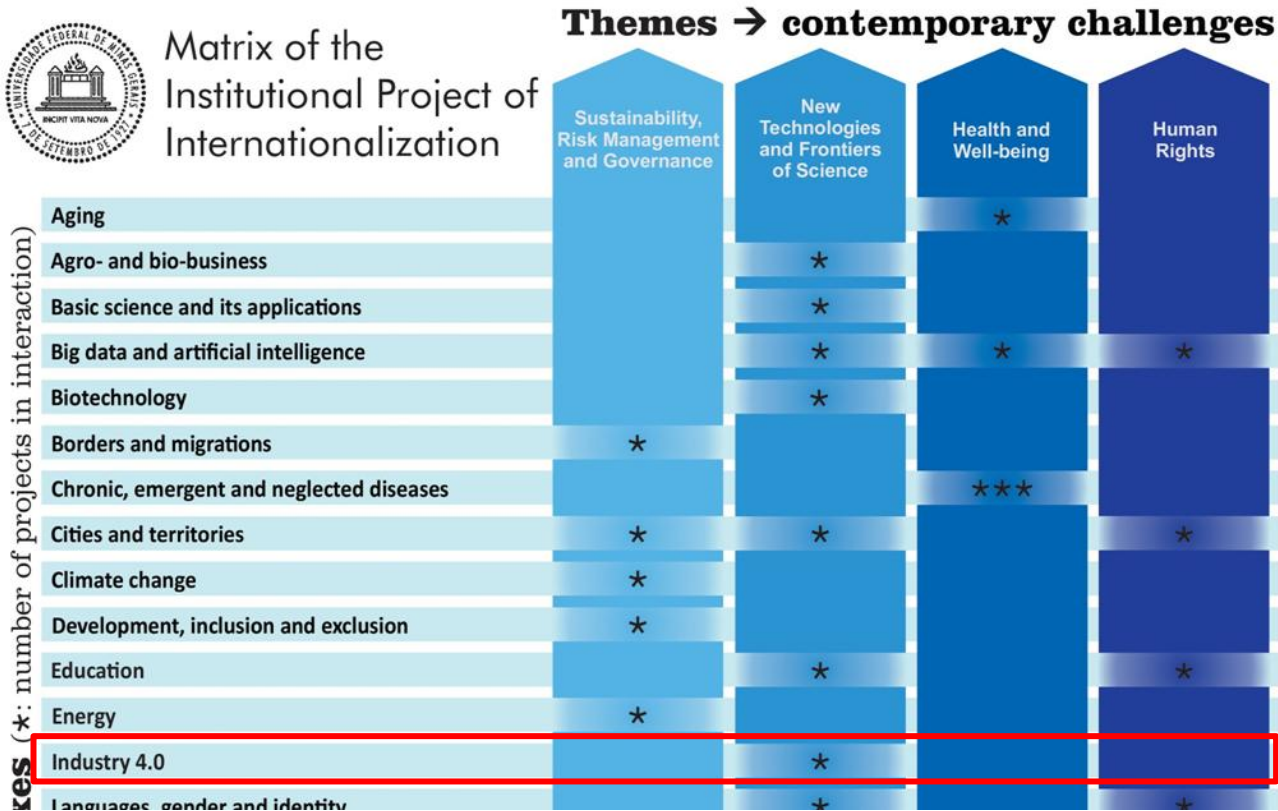
Partnership Building towards
Stronger Engagement in International Collaboration

Marcelo A Costa, Production Engineering, UFMG

UFMG, Belo Horizonte

19-23 November 2018

How PrInt/UFMG changes the ways we collaborate



PrInt/UFMG mobility goals

- To foster and enhance **collaboration** with partner universities worldwide by means of joint innovative research and capacity building of human resources
- To consolidate the **training and experience abroad of UFMG faculty members** with both a junior and a senior profile as visiting professors at partner universities
- To **train PhD students abroad** through internships at partner universities with a **strong focus on cotutelle** (double PhD degrees)
- To **recruit postdoctoral fellows and early-career researchers** with experience abroad to work at UFMG within the PrInt themes and projects
- To **attract internationally renowned visiting professors** with highly recognised experience for short stays (15 days) at UFMG

OUTGOING

- PhD mobility grants for internships abroad (six to twelve months)
- Junior Professor grants for visiting professorships abroad (six months)
- Senior Professor grants for visiting professorships abroad (six months)

INCOMING

- Postdoctoral grants for activities at UFMG (12 months, renewable)
- Early-career researcher grants for activities at UFMG (12 months, renewable)
- Senior Professor grants for international visitors at UFMG (15 days)

UFMG Graduate programs taking part in **Industry 4.0**

- **Computer Science**
- **Education: knowledge and social inclusion**
- **Genetics**
- **Management Sciences**
- **Philosophy**
- **Production Engineering**
- **Sanitation, Environment and Water Resources**
- **Economics**

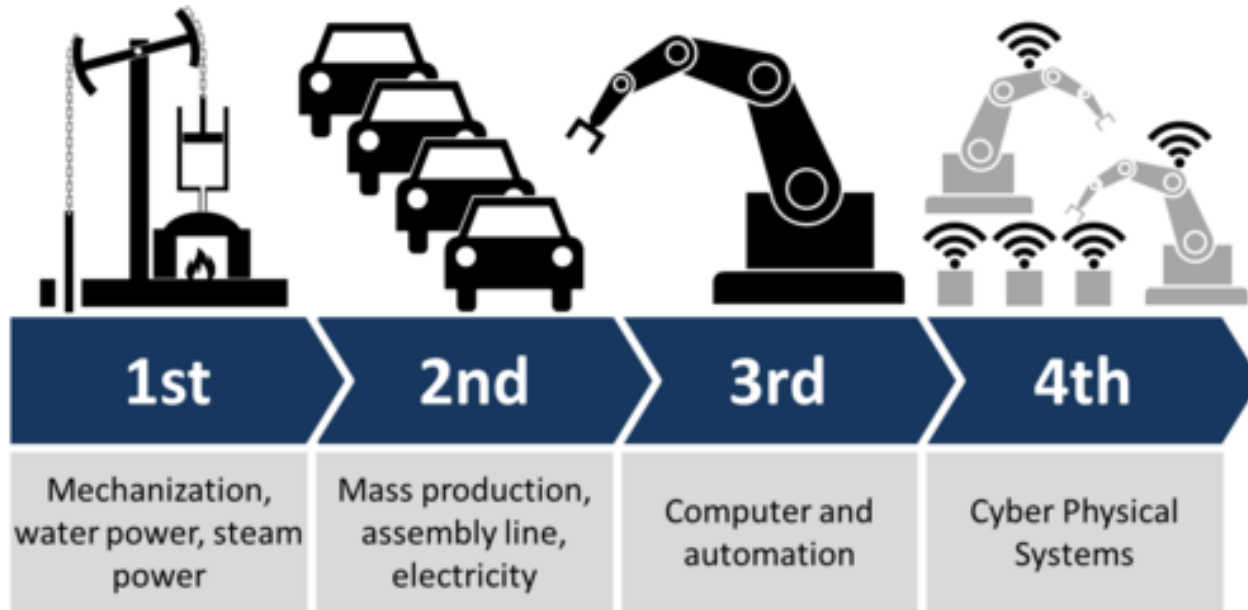
Partner institutions willing to collaborate with UFMG in this project (so far)

- University of Lille
- University of Münster



New collaborations will be most welcome!

What do we mean by **Industry 4.0**?



What do we mean by **Industry 4.0**?

Industry 4.0 can be seen as **Big data analysis**/**Business Intelligence**/**Business Analytics**:

- Data collection, data understanding and related fault/production challenges.
- Data from sensor can be applied to predict reliability of the production machines.
- Online optimization can be applied to production chains
- ...



Research issues and questions

Ongoing projects and related research questions

- **Computer Science**

- Robust decision making tools able to continuously learn from massive data.
 - Continuously collect, store and manage data in industrial processes.
 - Use appropriate data in Auto-ML techniques to learn hard-to-interpret parameters of highly complex non-linear systems.
 - Feed optimization models with learned parameters.
 - Run optimization algorithms and implement “optimal” decisions in the industrial setting.
 - Feedback



Research issues and questions

Ongoing projects and related research questions

- **Production engineering**
 - How to detect potential faults in industrial settings?
 - Data collection, statistical and machine learning models for fault prediction.
 - How to estimate efficient costs in electricity production.



Failure detection in robotic arms using statistical modelling and machine learning algorithms



ABB
ROBOTICS



li.u LINKÖPING
UNIVERSITY

Modelling of CEMIG business model using statistical, machine learning and tacit knowledge.

CEMIG

Coordinator: Prof. Marcelo A Costa (macosta@ufmg.br)

Ongoing and Prospective Collaborations



- Linköping University (Sweden)
- Technische Universität
Braunschweig (Germany)



Project/Interest: **Human-Industry 4.0 Interactions and Implications**

UFMG department (host): Department of Production Engineering – Research Line: Social Studies of Work, Technology and Expertise.

Goals: To discuss: (i) how Industry 4.0 impacts and change work organization and human-machine interfaces within large production systems as well as the labour market; (ii) the pros and cons of Industry 4.0 via-à-vis human intelligence and embodied skills; and

To improve (i) the design of these new production systems considering human expertise; and (ii) the cost/benefit analysis of human substitution within Industry 4.0.

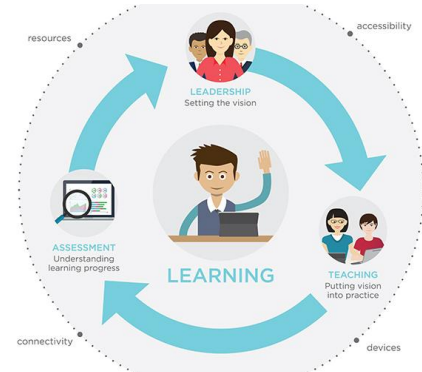
Partners: **UCBerkeley (USA)**, **Warwick Business School (UK)**

Coordinator: Prof. Rodrigo Ribeiro (rodrigoribeiro@ufmg.br)

Research issues and questions

Ongoing projects and related research questions

- **Education: knowledge and social inclusion**
 - How to balance productivity-health-education?
 - The improvement of the workers' skills through education development.



Concluding remarks for **Industry 4.0**

- UFMG has different expertises in the area of Industry 4.0, mainly divided into 3 groups:
 - Data collection, data understanding.
 - Methods/Techniques related to machine learning and applied statistics.
 - Education/Productivity/Health in industry environments
- In the long term, we want to be able to take advantage of a large amount of data to improve production systems
- Develop new collaborations with other institutions with similar and complementary expertises

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