Research Activity on LMI

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Our Research Activity on LMI at a glance

1. Stay current on published state-of-the-art algorithms and competing technologies in the literature

2. Define and prototype algorithms, frameworks as well as design research projects that aim at putting AI into Labour Market Intelligence for supporting decision making

3. Foster a cross-fertilisation between researchers on LMI and to publish original results and research reports

4. Repeat 1-3
(Some) Ongoing Activities in LMI

**Digital Skill Rate:** How digitalization is changing and affecting ICT and Non-ICT-based occupations?

**New Emerging Occupations:** identifying occupations by analysing changes in the lexicon composition

**H/S Skills as factor for Job Replacement:** Is there a correlation between the request for hard/soft skill and the probability for a job to be replaced by computerisation?

**LMI representativeness:** Use of statistical methods to estimate the representativeness of Web vacancies

**LMI Ontology:** Build-up the first LMI ontology via Graph-database

**Explainable LMI:** improve the believability of the analysis of our products by explaining the behaviour of black-box AI algorithms
New Emerging Occupations

**Goal:** To estimate potential new occupations by observing how the languages used in the job posts change over time

**Idea:** Use AI Language Models that can learn the lexicon used within million job vacancies (semi-supervised)

**How it works:** Given a job post, it returns the lexicon composition (i.e., the taxonomy class to which the language belongs and the related probability)
Languages derived from a job post looking for a “Data Scientist”

(A) Data Scientist. “LONDON: PERM: 40-50k p/a An opportunity has arisen for a Data Scientist to join a SME in central London. My client is doing exciting work in the Big Data/Social media space. This is a chance for a Data Science with a minimum of 12 months experience to join a growing organisation and gain exposure to cutting edge technologies and projects. The successful candidate MUST have at least 12 months experience in a Data Science position and solid experience of the following: * Natural Language Processing * Hadoop * MongoDB * Python/R * MySQL and NOSQL databases * Exposure to the following is desirable: * ElasticSearch * Scala * Pig * Hive * Java/Ruby * Docker * Deep Learning * Kafka The successful candidate will possess a MSc or higher in Computer Science, Statistics, Mathematics, or similar.
Languages derived for a job post looking for a “Data Scientist”


Contribution
A general approach to identify languages that differ from ones learnt from ISCO/ESCO taxonomies
→ New occupations!
H/S Skills as factor for Job Replacement

**Goal:** To measure the relevance played by soft skills, hard skills and digital skills in the computerization factor.

**Idea:** In 2017, a work by Frey and Osborne estimated the probability of computerization for a large number of detailed occupations in the US, spurring a considerable debate about the impact of the new technologies on the labor market. Match our data to empirically validate the work by Frey and Osborne.

**How it works:** Match WollyBI occupations (ISCO) on SOC taxonomy. Then, employ AI algorithms to find a correlation between the probability for a job to be replaced and the presence of certain skills (if exists) and to identify how the lexicon in advertising occupations and skills change over time.

**Colombo, Mezzanzanica & Mercorio:** Applying ML Tools on Web Vacancies for Labour Markets and Skill Analysis. “Terminator or the Jetsons? The Economics and Policy Implications of Artificial Intelligence”, 2018
H/S Skills as factor for Job Replacement

Lexicon Dissimilarity distribution on Job Skills between years 2014 and 2017 computed through Word2Vec

Lexicon Dissimilarity distribution on Job Titles between years 2014 and 2017 computed through Word2Vec

CRISP
Build-up an LMI Ontology

**Goal:** Formalise the Knowledge base of LMI as a graph-database.

**Idea:** Exploit the informative power of Web Job vacancies by modelling the resulting knowledge as a graph. This would allow analysts performing complex queries: such as: (1) similarities between professions over countries; (2) similarities between skills over countries; (3) skills to job; (4) professional paths between careers, etc.

**How it works.** Built on top of the SOTA Graph-database Neo4j.
Build-up an LMI Ontology

1330: Information and communications technology service managers
2511: System Analysts
Explainable LMI: Why Should I Trust you?

**Goal:** Use state-of-the-art XAI algorithms to make the behaviour of WollyBI explainable to users.

**Idea:** ML algorithms act like a black-box, and there is no way to guess the reason behind a decision.

eXplainable AI (XAI - launched by DARPA in 2016) aims at building a new generation of ML systems able to explain their decision in a human manner.

**How it works.** Given any job post, it returns the top-terms that guided the classification and their probability. It also performs the same for a class of occupations.

**Benefits for our customers:** Improved reliability of analysis and believability of our products.
From AI to XAI

Source: DARPA
From XAI to XLMI

Machine Learning System

This is a cat.
Current Explanation

XAI Explanation

ML explains itself

Finance Managers
Code 1211

Financial and insurance services branch managers
Code 1346

Source: DARPA
Intuition

1. Explain the system’s behaviour for each occupation
2. Summarise the features (aka, words) contribution in a visual way
3. See if there exists some features that are wrong
4. Refine the model and iterate until a satisfactory accuracy level is reached
Some references
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Thanks for your attention