UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

itee PhD information technology electrical engineering

DIETI UNINA

Arianna Anniciello

Digital Transformation: Artificial Intelligence Business Case

Tutor: Elio Masciari

Cycle:XXXVIII Year:2

itee PhD information technology electrical engineering

Candidate's Information

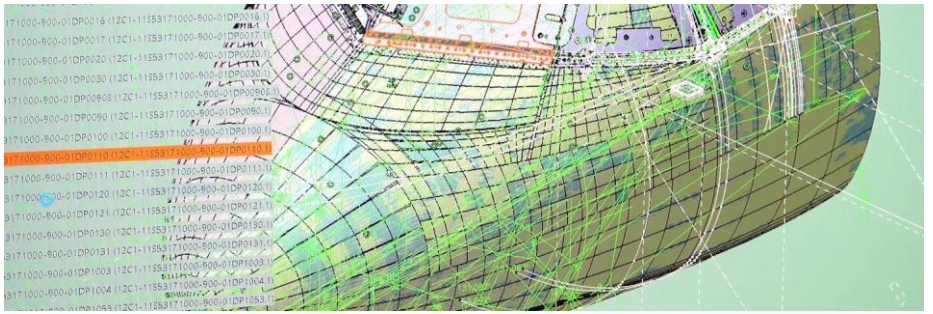
- MSc degree: Management Engeneering
- Research group: Picus Lab
- PhD start date: 01/11/2022
- Scholarship type: none

Research field of interest

- **Artificial Intelligence & Decision Making**

Summary of study activities

- Digital Twin in Manufacturing.



- Project Management Professional Certificate

- Artificial Intelligence Risks Management Framework

Summary of study activities

- Conferences / events attended
  - 2022 IEEE International Conference on Bioinformatics and Biomedicine – IEEE BIBM 2022 – December 6-9, Las Vegas and Online
  - 2023 31st Euromicro International Conference on Parallel, Distributed and Network-Based Processing – PDP 2023 – March 1-3, Naples, Italy – Accepted paper
  - 2023 European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases - ECML PKDD 2023 – September 18-22, Turin, Italy and Online

Research activity: Overview (1/4)

- Problem

  Help decision-makers make rational, global, and collective choices

  ## Objective

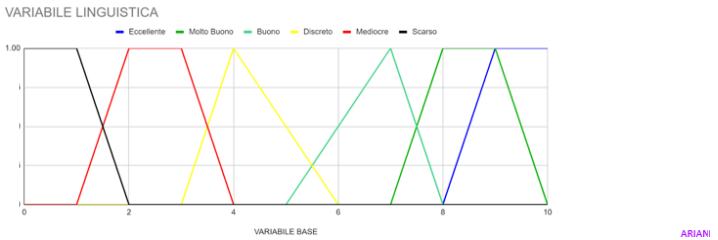
  Distilling human expertise and enhancing it through a perpetual learning mechanism driven by feedback data from the actual performance of decisions made.

  ## Methodology

  Our first approach to enhance Decision Making Processes was the application of Computational Social Choice blending first clustering algorithms and then Multicriteria Decision Making (MCDM) tools with Majority Judgment,.

Research activity: Overview (2/4)

MJ rating scale	Min Value	Most Likely Value	Max Value	Fuzzy Number
Very Poor	0	1	2	(1,2,2)
Poor	1	2	3	(3,4,4)
Decent	3	4	5	(4,5,6)
Good	5	6	7	(7,8,8)
Very Good	7	8	9	(8,9,9)
Excellent	8	9	10	(9,10,10)



Multicriteria Majority Judgment

A rating scale in natural language to express a judgment for each criteria for each alternative.

Decision Makers' judgments are aggregated using MJ, finding a *majority grade* for each leaf element.

Judgment on the scale are converted into triangular fuzzy numbers.

Hierarchical recomposition method is applied to get to a colletive global evaluation for each alternative.

Algorithm 1

Require: $k \geq 0$
Ensure: $n\_winners = (n_1, ..., n_k), k > 1$
  $k \leftarrow number\_winners$
  $max\_cluster \leftarrow k$
  $condition \leftarrow$ "ko"
  while $condition =$ "ko" **do**
    $cluster\_list \leftarrow cluster(vote\_list)$
    for all list_cluster **do**
      $winners\_per\_cluster \leftarrow compute\_winners(cluster)$
      $all\_winners \leftarrow list\_of\_all\_winners(winners\_per\_cluster)$
    end for
    $list\_winner\_distinct = list\_of\_all\_distinct\_winners(all\_winners)$
    $option\_remaining \leftarrow number\_winners - len(list\_winner\_distinct)$
    if $option\_remaining = 0$ **then**
      $condition =' ok'$
    else
      $k \leftarrow option\_remaining$
      $condition \leftarrow' ko'$
    end if
  end while

Research activity: Overview (3/4)

Problem

Aritificial Intelligence pose risks that can negatively impact people, organizations and the Environment

Objective

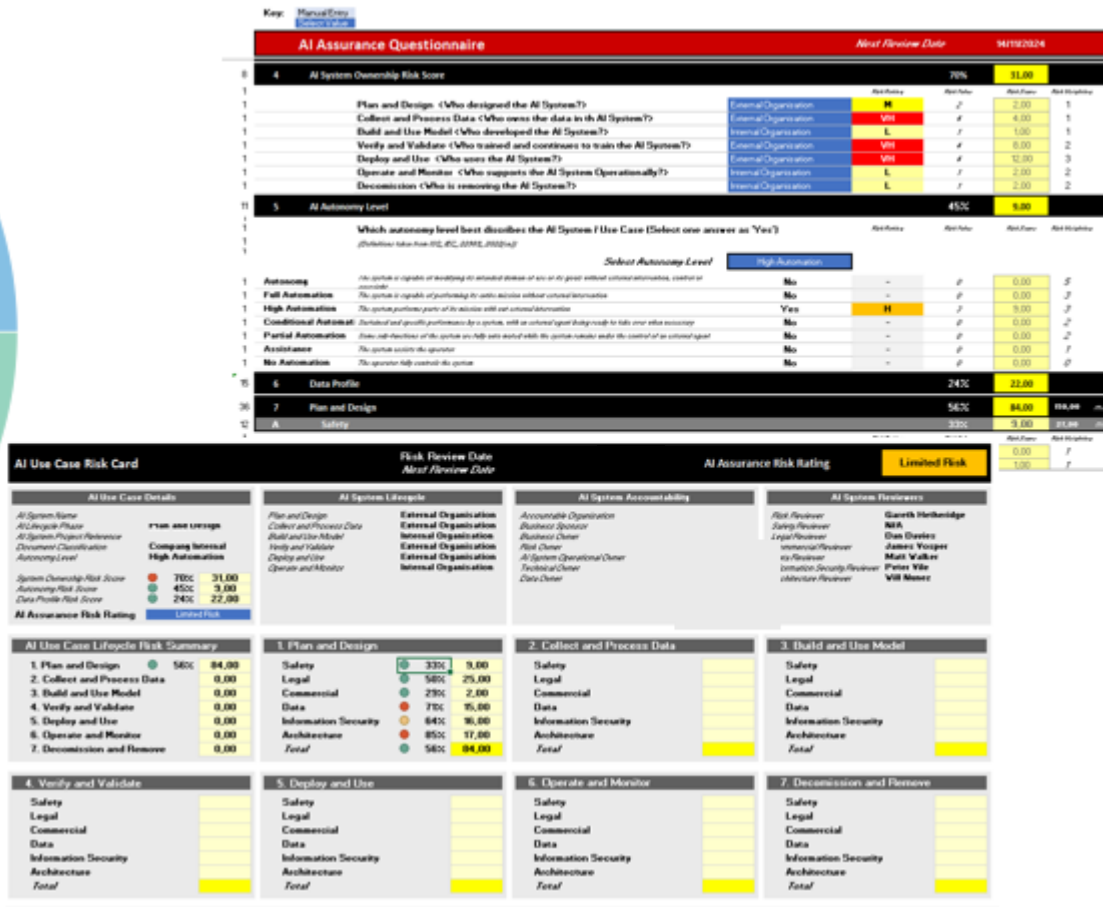
Assessing risks associated with Artificial Intelligence implementations in business environment.

Methodology

Defining a Risk Management Framework to evaluate different risk perspectives associated with artificial intelligence applications for an enterprise.

Research activity: Overview (4/4)

Legal, Commercial, Data, Security, Architecture are some of the perspective for AI Risk evaluation



Products

[P1]	*Cluster algorithm for social choice – A. Anniciello, E. d'Ajello, D. Formica, E. Masciari, G. Mattia, C. Moscariello, S. Quintarelli and D. Zaccarella, European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, ECML PKDD 2022 Workshops, published.*
[P2]	*Covid-19 impact on health information technology: the rapid rise of e-Health and Big Data driven innovation of healthcare processes. – A. Anniciello, S. Fioretto, E. Masciari, E. Napolitano, 2022 IEEE International Conference on Bioinformatics and Biomedicine – BIBM – published*
[P3]	*A Judgment Aggregation Method For Fuzzy Multi Criteria Decision Making – A. Anniciello, E. Masciari, 31st Euromicro International Conference on Parallel, Distributed, and Network-Based Processing, PDP 2023, published*
[P4]	*Digital Twins for Traffic Congestion in Smart Cities: A Novel Solution Using Data Mining Techniques – A. Anniciello, S. Fioretto, E. Masciari, E. Napolitano, 2023* 15th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management, KMIS 2023, published

Next Year

- Assessing Artificial Intelligence ROI for Enterprises

  A relevant question to be solved, which could be valuable for both scientific and business community, is the evaluation of costs and benefits associated with artificial intelligence applications in a business company.

  Considering the hype on AI, companies need to evaluate carefully which project to invest on, and there is no simple answer to these questions. In order to enable digital transformation, it is of outmost importance to be able to assess costs and benefits of an AI project and give management tangible data to prioritize their investments.

Thank you for your attention