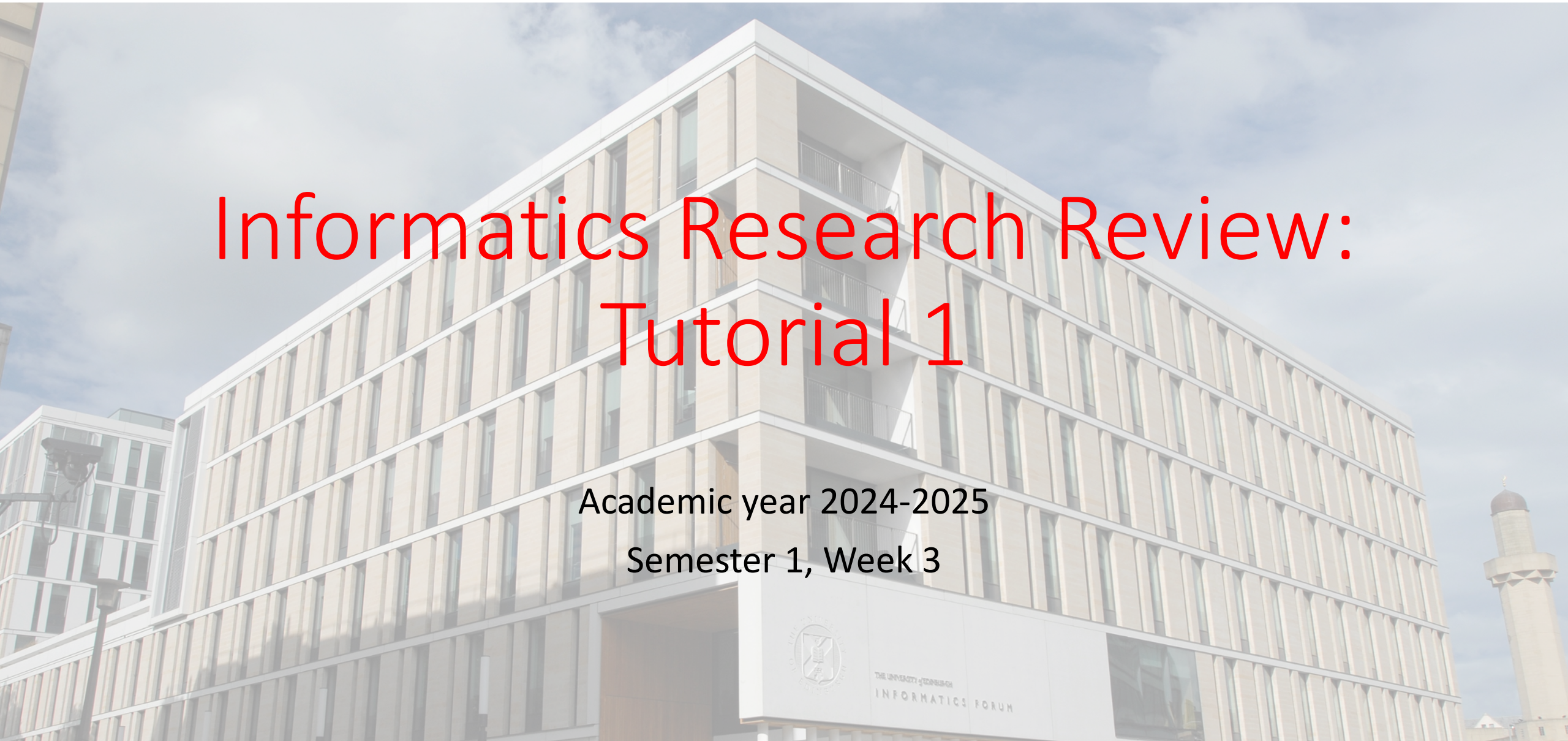

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Informatics Research Review: Tutorial 1

Academic year 2024-2025

Semester 1, Week 3

Overview

1. **Elevator pitch** (10 min)
2. **Practice Speed Reading: Main Aim(s) and Key Results** (15 min)
3. **Context and Topic Choice** (25 min)

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1) Elevator ‘pitch’ (10 mins)

- This activity will follow an **‘elevator pitch’** format, aimed at focusing your attention to distil and deliver information in an efficient manner.

- In this tutorial, the ‘elevator pitch’ involves introducing yourself in under 30 seconds.

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1) Elevator ‘pitch’ (10 mins)

For your brief (30s) presentation today, here are some **guiding questions**:

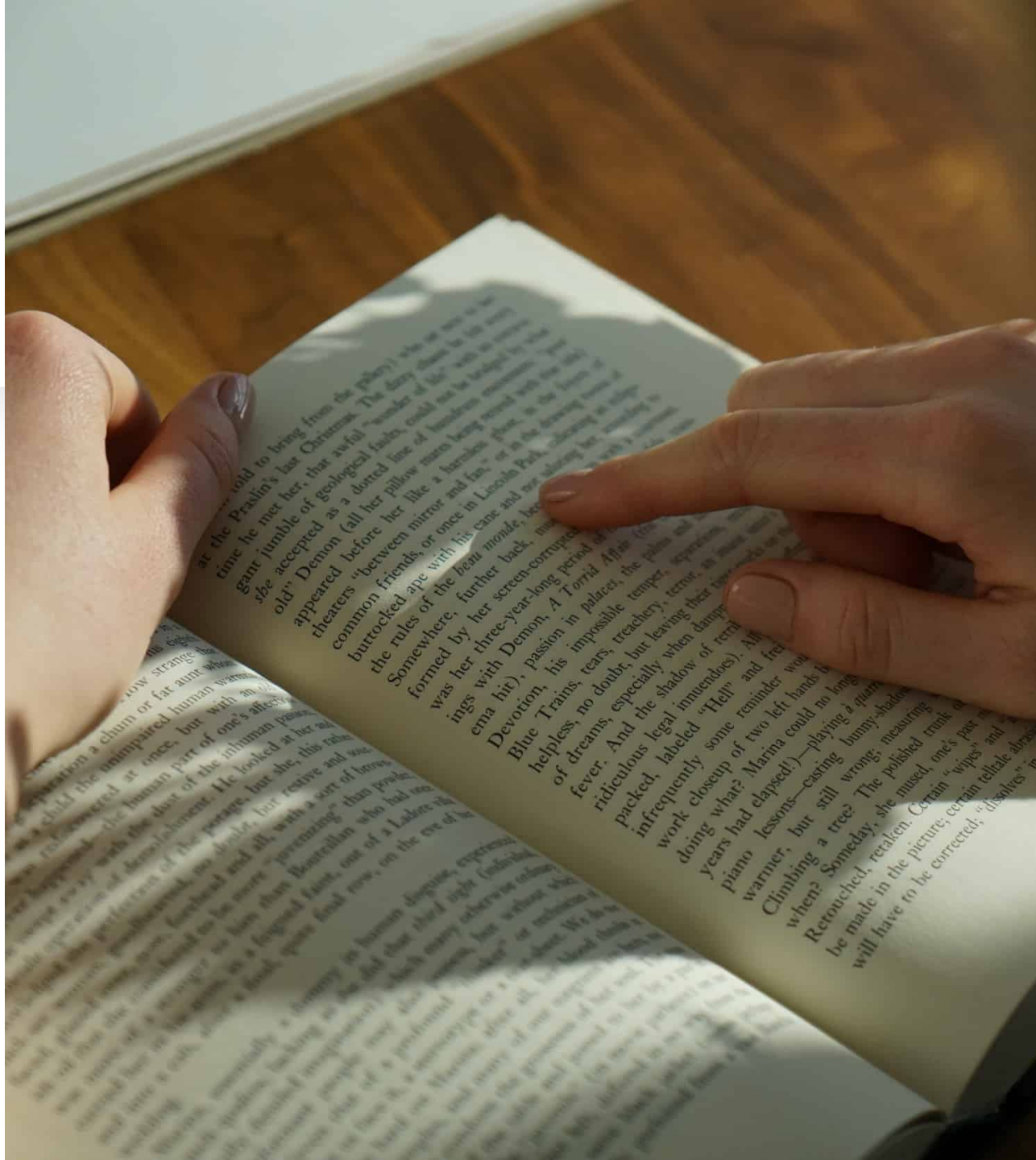
- What is your name?
- What is your MSc programme?
- What would you like to learn during your IRR and why?

Speed Reading

- **Average reading speed:** 250 words/minute
- **Average number of papers cited in academic papers:** 50 papers
- Be **selective**, speed-read **Title** and **Abstract** for context and key results when selecting papers to read:
  a) **Not useful:** Don't read it, move on.
  b) **Maybe:** Quickly browse through abstract and paper to help identify whether it is relevant to you (~ 5 min).
  c) **Useful as foundation:** Invest time into reading the material in detail and take notes/highlights (~ 2 hours).
  d) **Useful as supporting evidence:** Quickly skim the paper and highlight/take notes of the sections you are mostly interested at this time (~ 1 hour).

2) Speed Reading (15 min)

- 5 abstracts from academic papers (including 2 research reviews, 1 & 4) will be displayed (2 min per abstract)
- Working Individually (10 minutes in total):
  - Speed read the abstract
  - Write down the **Main Aim(s)** and **Key Results** of each of the abstracts (feel free to use bullet points)



Abstract 1: 148 words

Title: Mapping Machine Learning Advances From HCI Research to Reveal Starting Places for Design Innovation

Abstract: “HCI has become particularly interested in using machine learning (ML) to improve user experience (UX). However, some design researchers claim that there is a lack of design innovation in envisioning how ML might improve UX. We investigate this claim by analyzing 2,494 related HCI research publications. Our review confirmed a lack of research integrating UX and ML. To help span this gap, we mined our corpus to generate a topic landscape, mapping out 7 clusters of ML technical capabilities within HCI. Among them, we identified 3 under-explored clusters that design researchers can dig in and create sensitizing concepts for. To help operationalize these technical design materials, our analysis then identified value channels through which the technical capabilities can provide value for users: self, context, optimal, and utility-capability. The clusters and the value channels collectively mark starting places for envisioning new ways for ML technology to improve people’s lives.”.

Abstract 2: 130 words

Title: A Model for Learning the Semantics of Pictures

Abstract: “We propose an approach to learning the semantics of images which allows us to automatically annotate an image with keywords and to retrieve images based on text queries. We do this using a formalism that models the generation of annotated images. We assume that every image is divided into regions, each described by a continuous-valued feature vector. Given a training set of images with annotations, we compute a joint probabilistic model of image features and words which allow us to predict the probability of generating a word given the image regions. This may be used to automatically annotate and retrieve images given a word as a query. Experiments show that our model significantly outperforms the best of the previously reported results on the tasks of automatic image annotation and retrieval.”

Abstract 3: 154 words

Title: Deep Physiological Affect Network for the Recognition of Human Emotions

Abstract: “Here we present a robust physiological model for the recognition of human emotions, called Deep Physiological Affect Network. This model is based on a convolutional long short-term memory (ConvLSTM) network and a new temporal margin-based loss function. Formulating the emotion recognition problem as a spectral-temporal sequence classification problem of bipolar EEG signals underlying brain lateralization and photoplethysmogram signals, the proposed model improves the performance of emotion recognition. Specifically, the new loss function allows the model to be more confident as it observes more of specific feelings while training ConvLSTM models. The function is designed to result in penalties for the violation of such confidence. Our experiments on a public dataset show that our deep physiological learning technology significantly increases the recognition rate of state-of-the-art techniques by 15.96 percent increase in accuracy. An extensive analysis of the relationship between participants’ emotion ratings and physiological changes in brain lateralization function during the experiment is also presented.

Abstract 4: 221 words

Title: Literature review: Machine learning techniques applied to financial market prediction

Abstract: “The search for models to predict the prices of financial markets is still a highly researched topic, despite major related challenges. The prices of financial assets are non-linear, dynamic, and chaotic; thus, they are financial time series that are difficult to predict. Among the latest techniques, machine learning models are some of the most researched, given their capabilities for recognizing complex patterns in various applications. With the high productivity in the machine learning area applied to the prediction of financial market prices, objective methods are required for a consistent analysis of the most relevant bibliography on the subject. This article proposes the use of bibliographic survey techniques that highlight the most important texts for an area of research. Specifically, these techniques are applied to the literature about machine learning for predicting financial market values, resulting in a bibliographical review of the most important studies about this topic. Fifty-seven texts were reviewed, and a classification was proposed for markets, assets, methods, and variables. Among the main results, of particular note is the greater number of studies that use data from the North American market. The most commonly used models for prediction involve support vector machines (SVMs) and neural networks. It was concluded that the research theme is still relevant and that the use of data from developing markets is a research opportunity”.

Abstract 5: 156 words

Title: BrainHood: towards an explainable recommendation system for self-regulated cognitive training in children

Abstract: **“**There is evidence that cognitive and executive functions are mental capabilities that children need in order to successfully learn in school. Serious Games (SG) and Games for Health (G4H) have been extensively used as tools to promote health and well-being in children. Cognitive games are a type of educational games which focus on enhancing cognitive functioning in children with different profiles of executive functions and cognitive development. We propose a system for self-regulated cognitive training for children, which enables the child to reflect on their own progress, weaknesses and strengths, and self-arrange their training materials, promoting self-regulated learning skills. We provide a narrative review of research in cognitive training for children and in explainable recommendation systems for children in educational settings. Based on the review, an experimental testbed is proposed to explore how transparency, explainability and persuasive strategies can be used to promote self-regulated learning skills in children, considering individual differences on abilities, preferences, and needs”.

Paper	Title	Main aim(s)	Key Results
1	Mapping Machine Learning Advances From HCI Research to Reveal Starting Places for Design Innovation	To investigate the integration of machine learning (ML) and user experience (UX) within HCI, identify gaps, and suggest new areas for innovation by analysing research publications and mapping out ML technical capabilities and value channels.	By mapping out 7 clusters of ML technical capabilities within HCI papers reviewed, it finds that research on the integration of UX and ML is lacking. The research also identifies 4 value channels through which the identified clusters of technical capabilities can provide value for users: self, context, optimal, and utility-capability.
2	A Model for Learning the Semantics of Pictures	To outperform previously reported results in automatically annotating and retrieving images using a model that links image regions to text queries.	The proposed model significantly outperforms the best of the previously reported results on the tasks of automatic image annotation and retrieval.
3	Deep Physiological Affect Network for the Recognition of Human Emotions	To advance the field of emotion recognition by presenting a novel approach that combines advanced machine learning techniques with physiological data, thereby improving accuracy and understanding in this area	Proposes a new model, based on a convolutional long short-term memory ConvLSTM framework network and a new temporal margin-based loss function. This new loss function allows the model to be more confident as it observes more of specific feelings while training ConvLSTM models, leading to improvements on the performance of emotion recognition (↑ accuracy by 15.96%).
4	Literature review: Machine learning techniques applied to financial market prediction	To provide state-of-the-art of machine learning applications in financial market prediction, while also identifying existing trends and opportunities for future investigation.	From the 57 texts reviewed, which were categorized as “markets”, “assets”, “methods”, and “variables”, indicated that: (i) a great proportion of literature employed data from North American markets, and that (ii) the most commonly predictive models employed were SVM and Neural Networks.
5	BrainHood: towards an explainable recommendation system for self-regulated cognitive training in children	To empower children to take control of their learning experience by facilitating self-reflection on their progress and helping them identify their strengths and weaknesses, ultimately aiming to enhance educational outcomes and promote cognitive development.	Proposes a system for self-regulated cognitive training for children, aimed at enabling the child to reflect on their own progress, weaknesses and strengths, and self-arrange their training materials, promoting self-regulated learning skills. Furthermore, based on a review, an experimental testbed is proposed to explore how transparency, explainability and persuasive strategies can be used to promote self-regulated learning skills in children, considering individual differences on abilities, preferences, and needs.

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3) Topic Choice (20 mins)

You will be tasked with evaluating the **Context** and **Topic** of a previous IRR example from https://opencourse.inf.ed.ac.uk/irr/resource-list.

High-quality Context and Topic writing often align with the following criteria:

- **Context:** The research context is clearly outlined, and it provides adequate contextual information for a non-expert reader to become familiar with the field in question and to navigate the rest of the IRR effectively.
- **Topic:** The topic is specific enough and well-motivated. Research review focus has been narrowed by specific criteria, such as geographic region, time period, population, methodology, type of publication, and others.

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3) Topic Choice (20 mins)

Write down the answers to the following questions:

1. What is the context of the IRR?
2. What is the topic of the IRR?
3. Does the topic appear viable (sufficiently narrow)?
4. Is the terminology used to describe the context and topic clear and well-defined?
5. Does the topic seem to match the title and the abstract? If not, how could this be improved?
6. (optional) What key insights and learnings can you gain regarding the context and topic of the IRR?
7. (optional) In your opinion, does the IRR contribute to the understanding of the topic reviewed? Please provide the reasoning to your opinion.

Share your answer with the entire group