Recognizing Reader's Affect Using EEG Data

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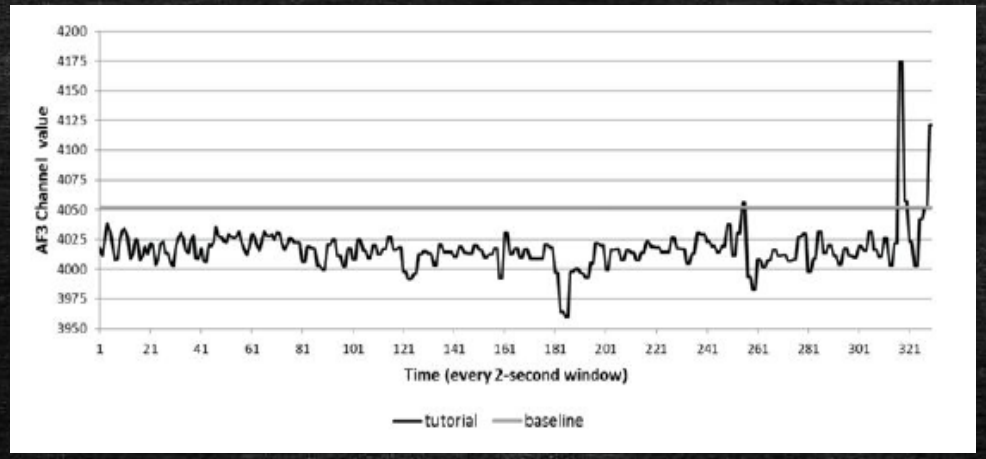
Outline of the Presentation

1. Research Description
2. Review of Related Literature
3. Research Methodology

Introduction



There is no current work that has studied **brainwave patterns** and their association to **affect** while a person is **reading literary fiction**.

Research Problem

Objectives / Scope and Limitations

To build an **affect model** that associates the EEG signals collected from readers (while they are reading stories) to specific emotions.

General Objective

Specific Objective #1

Objective

- To **review** the approaches, methodologies, and experiments of existing affect detection or recognition studies that uses EEG data;

Scope and Limitation

- A review of **existing affect detection or recognition studies** that uses EEG data.

Specific Objective #2

Objective

- To **identify** the different emotions the can be elicited from the readers by the stories;

Scope and Limitation

- A review of **different emotion models** and determine which of them is appropriate for reader affect.

Specific Objective #3

Objective

- To **build** a corpus of EEG signals;

Scope and Limitation

- The participants will be people of ages between 18 to 25
- **They will read pre-selected short stories while an EEG sensor is attached to them**
- The set-up of Miall and Kuiken (1994) will be used as basis

Specific Objective #4

Objective

- To **determine** which elements of a story affects the reader's emotional state;

Scope and Limitation

- The study will attempt to determine which element of the story **triggered** the reader to evoke that emotion.
  - character traits and behavior
  - reader's empathy to the character
  - the story plot or casual chain of story events
  - lexical choices and sentence structure.

Specific Objective #5

Objective

To **implement** supervised and unsupervised machine learning algorithms for classifying the emotion based on the EEG signals;

Scope and Limitation

- A review of related literature **to identify** unsupervised or supervised classification techniques **best suited** for the data

Specific Objective #6

Objective

To **define** evaluation metrics for assessing the performance of the model;

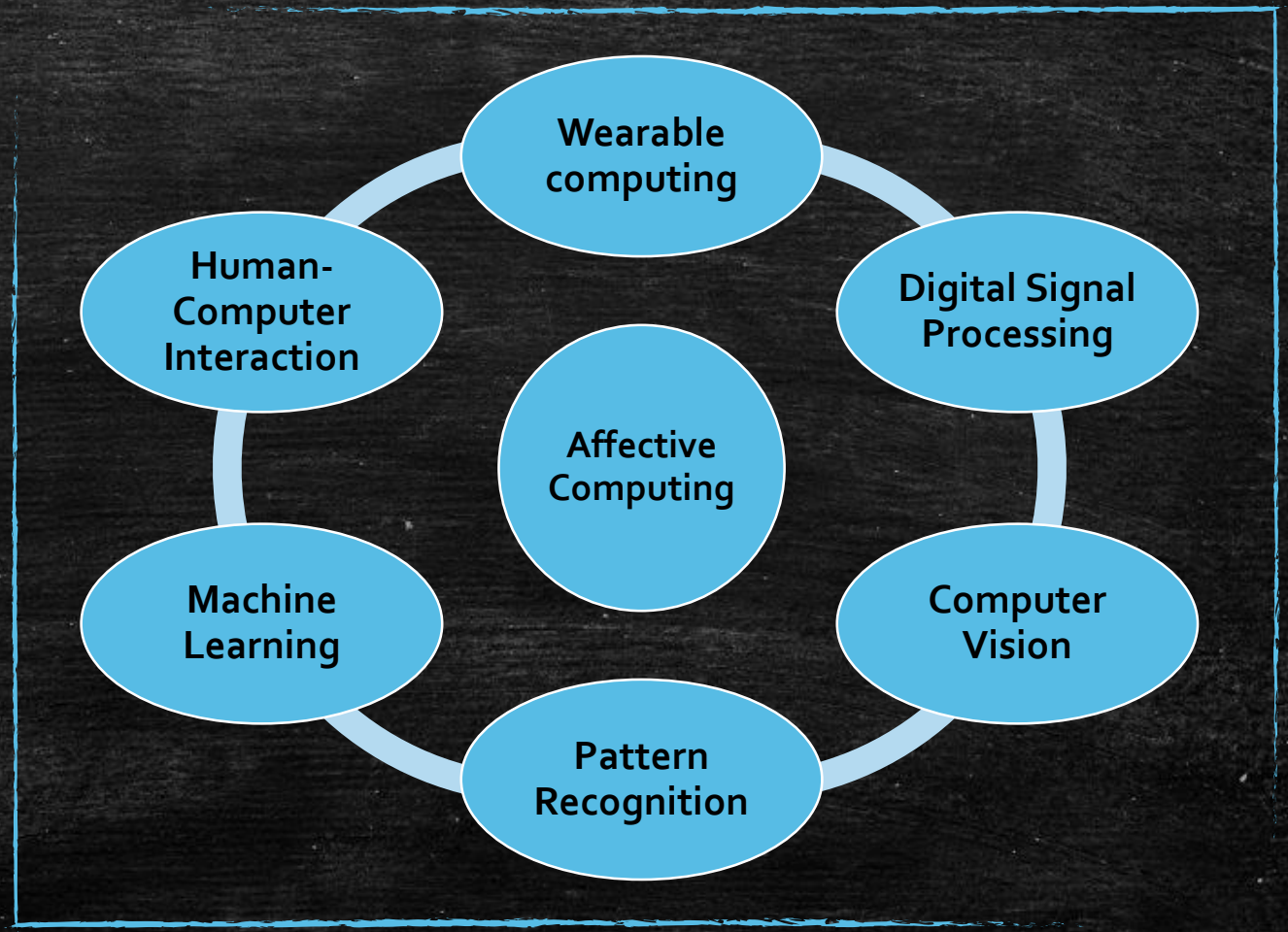
Scope and Limitation

- Precision
- Recall
- F-measure

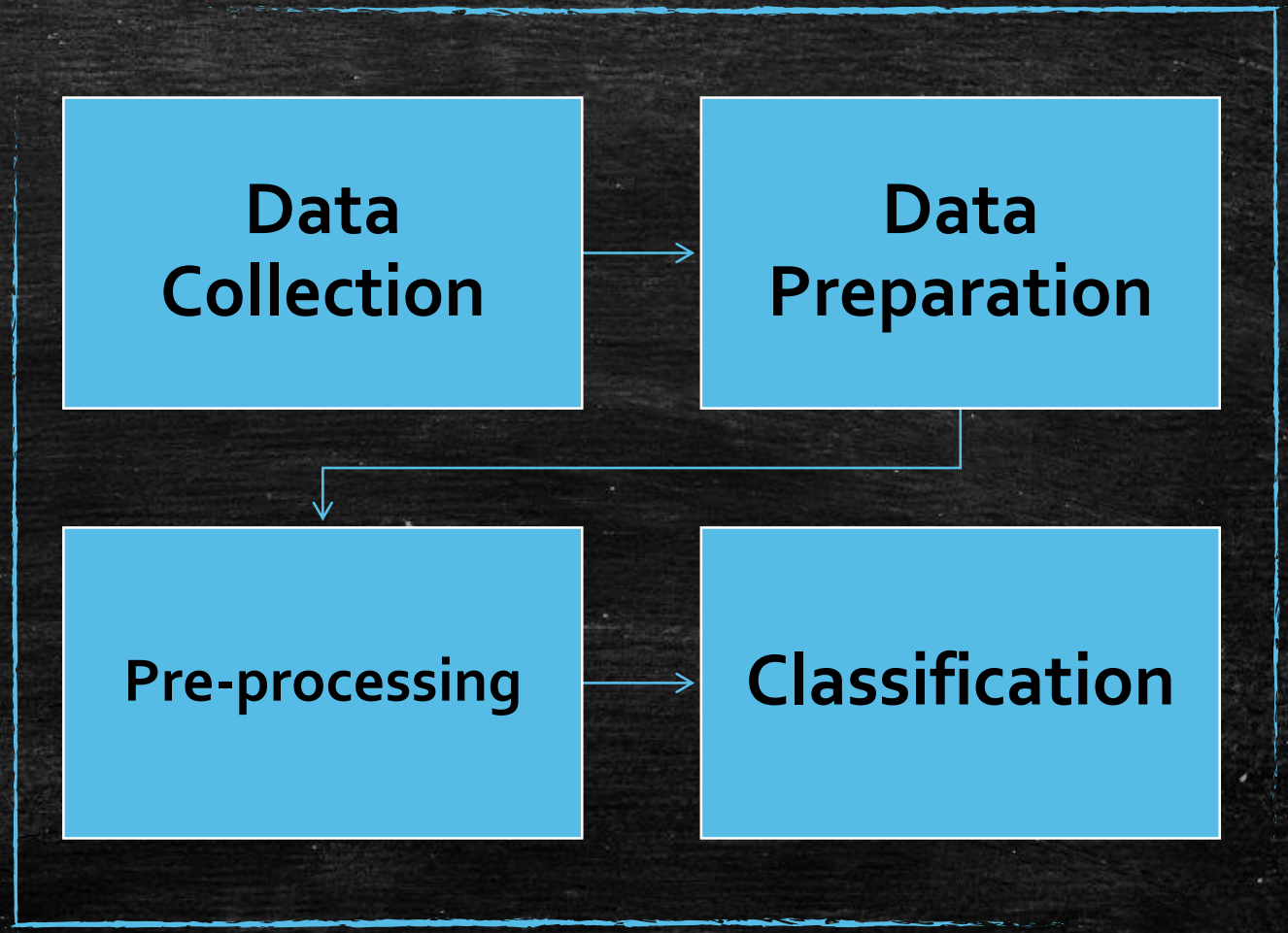
Research Significance

Affective Computing

Explore the **feasibility** and **application** of these existing areas on an **unexplored domain**.



Methodology and Experiments



Serve as **basis and reference** for related future studies.

Affect-Related Systems

Results of this study can be further utilized in **intelligent tutoring systems** (ITS) or **embodied conversational agents** (ECA).

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Beyond Computer Science…

The findings of this work may be informative to **affective science**, **psychology**, and other related fields.

Review of Related Literature

Emotions and Computing

- Definition of emotions (Kleinginna Jr. and Kleinginna, 1981)
- Relevance of emotions as proven in neurology (Bechara et al., 2000) and social psychology (Schwarz, 2000)
- Emotional intelligence (Salovey and Mayer, 1990)
- Affective computing, affect recognition, and challenges in affective computing (Picard, 1997;2000;2003)

Five Factors on Obtaining Good Affect Data

Subject-elicited vs. event-elicited	Does subject purposefully elicit emotion or is it elicited by a stimulus or situation outside the subject's efforts?
Lab setting vs. real-world	Is subject in a lab or in a special room that is not their usual environment?
Expression vs. feeling	Is the emphasis on external expression or on internal feeling?
Open-recording vs. hidden-recording	Does subject know that anything is being recorded?
Emotion-purpose vs. other-purpose	Does subject know that the experiment is about emotion?

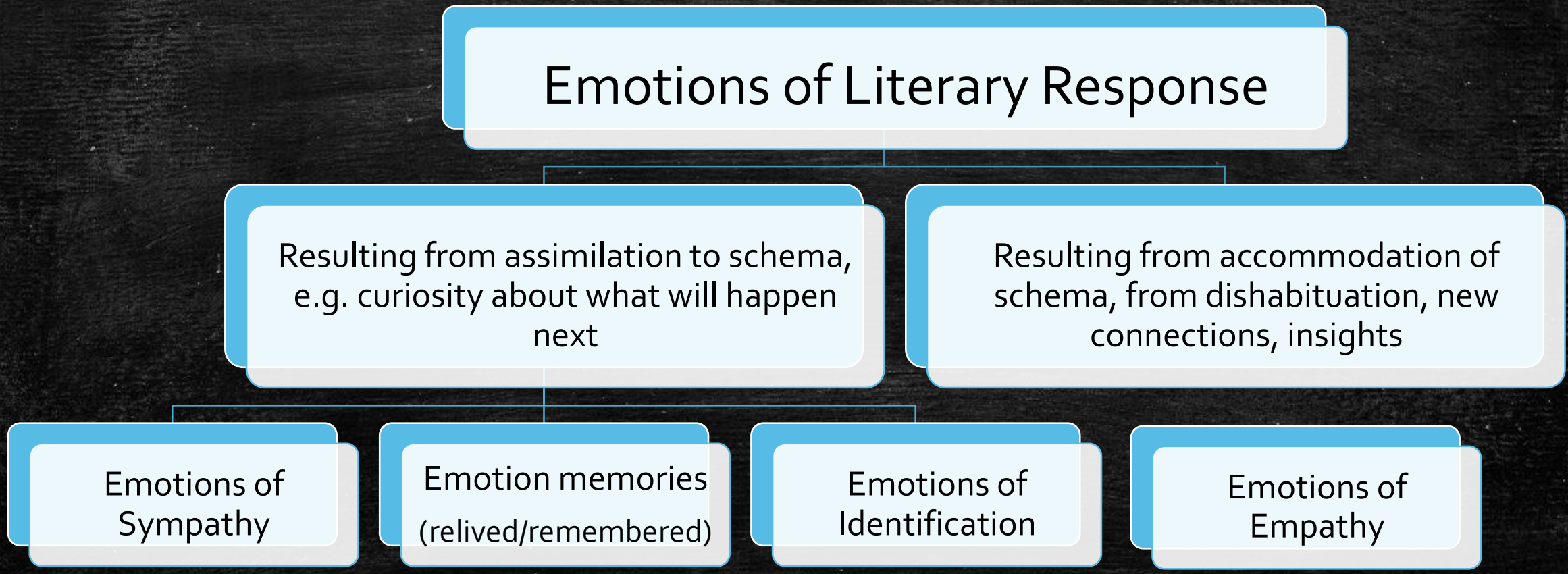
Emotions and Brainwaves

- Azcarraga and Suarez (2013)
  - confidence, excitement, frustration, and interest
  - event-elicited, lab-setting, feeling, open-recorded, emotion-purpose
  - Multi-Layered Perceptron (MLP) and Support Vector Machines (SVM)
  - precision, accuracy, F-measure

Emotions and Reading Fiction

- The act of reading and its importance (Freire & Slover, 1983; Mar et al., 2009; Kidd and Castano, 2013; Vezzali et al., 2015)
- Reader-response criticism (Tompkins, 1980)
- Taxonomy of narrative emotions (Oatley, 1995; Mar et al., 2011)

Taxonomy of Emotions



Emotions and Reading Fiction

- Miall and Kuiken (1994)
  - 3 literary stories divided roughly into equal segments using phrase and sentence divisions while still retaining meaningful units as far as possible (approx. 77-86 segments per story).
  - Employed 1st and 2nd reading
  - 2nd reading: story segments are presented again one at a time, with reference to the two previous and succeeding segments, then rate the segments based on strikingness (1 to 5 scale) and affect (no feeling to strong feeling).

Research Methodology

Activities	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(1)	****	****	****	**__								
(2)			__**	**__	**__							
(3)					__**	****	**__		_***	****		
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1) Concept Formulation and Review of Related Literature
2) Development of Data Collector Tool
3) Data Collection and Corpus Building
4) Training and Evaluation
5) Documentation