

Emotion Recognition Based on Signal Processing

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Why Emotion Recognition in HCI?

1

Natural way of interaction
for humans

2

Computers will
understand human
input more precisely
and respond accordingly

3

Ease interaction
between human and
computers

How We recognise emotions

- ✓ Emotions from speaker's tone
- ✓ Emotions from facial expressions
- ✓ Emotions from Body Gesture

P. Ekman's 6 basic Emotions (Universal)



sadness



disgust



anger



surprise



fear



happiness

Why recognizing emotions is difficult for a computer.

Differentiating Emotions

Acted

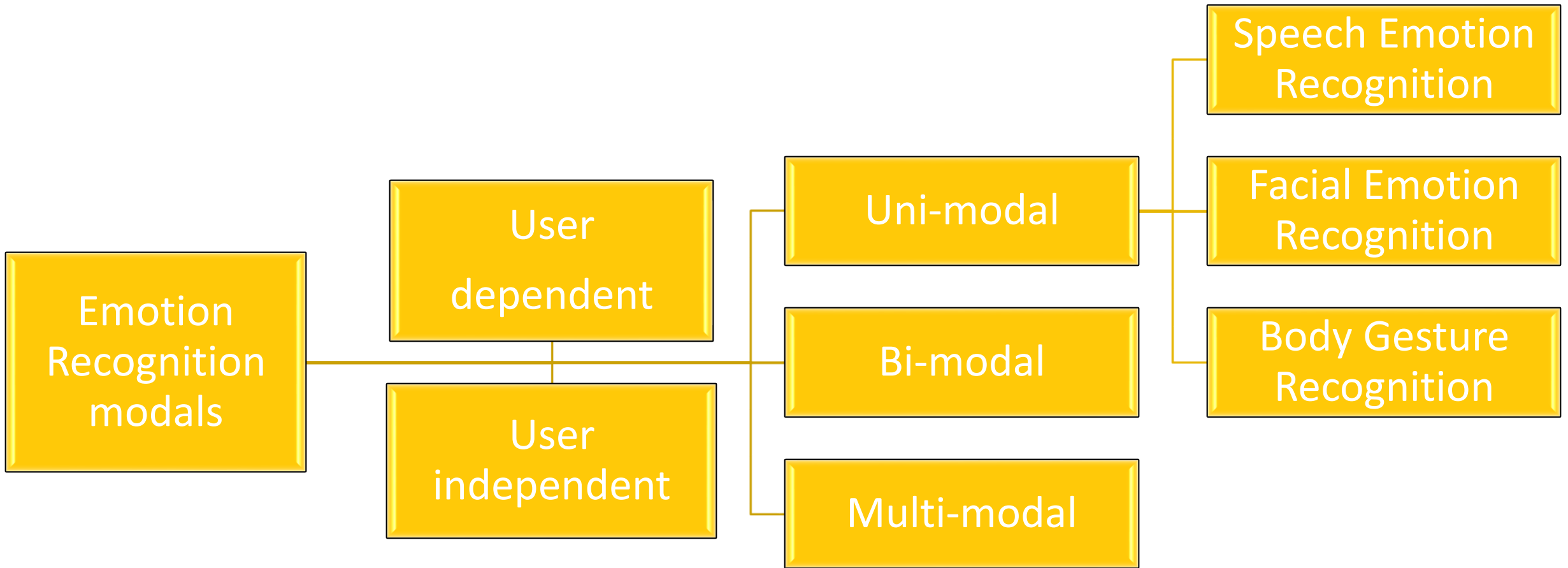
Spontaneous

Emotions Depends on

Gender

Age Group

Cultural Diversity

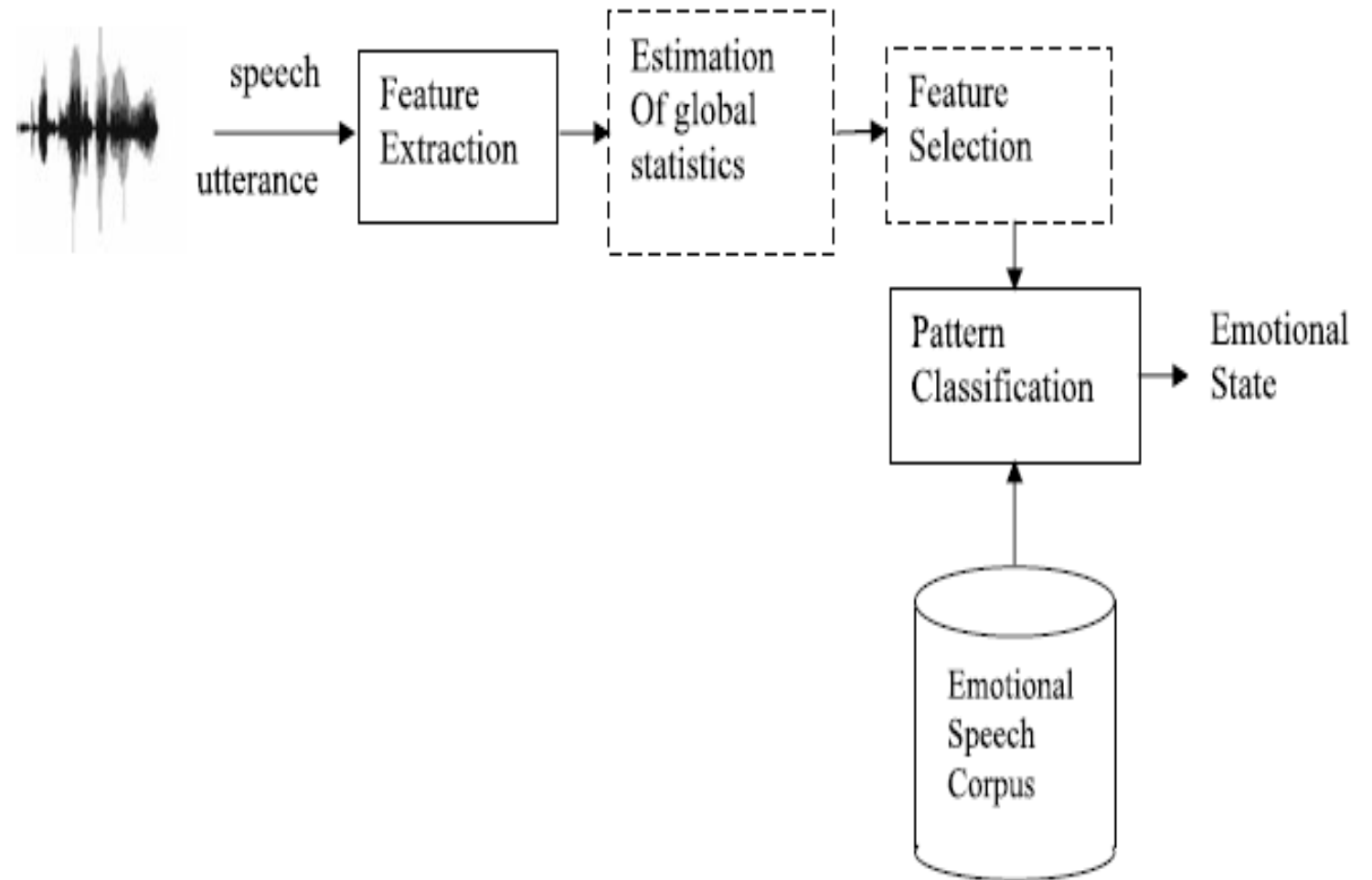


Speech Emotion Recognition

Verbal Communication contains 45% of emotion information

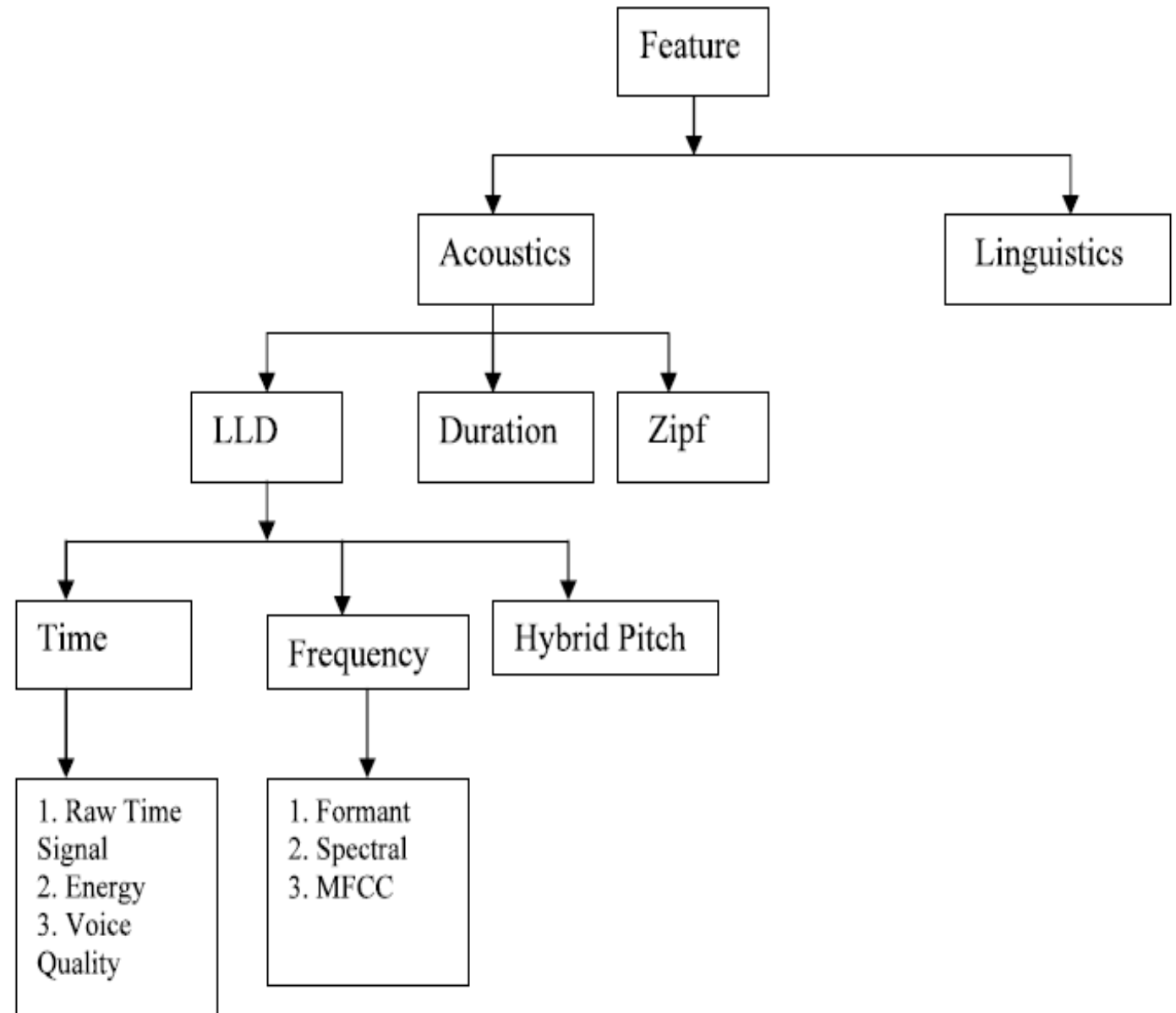
- Voice intonation 38%
- Actual word 7%

Availability of sufficient dataset is major concern

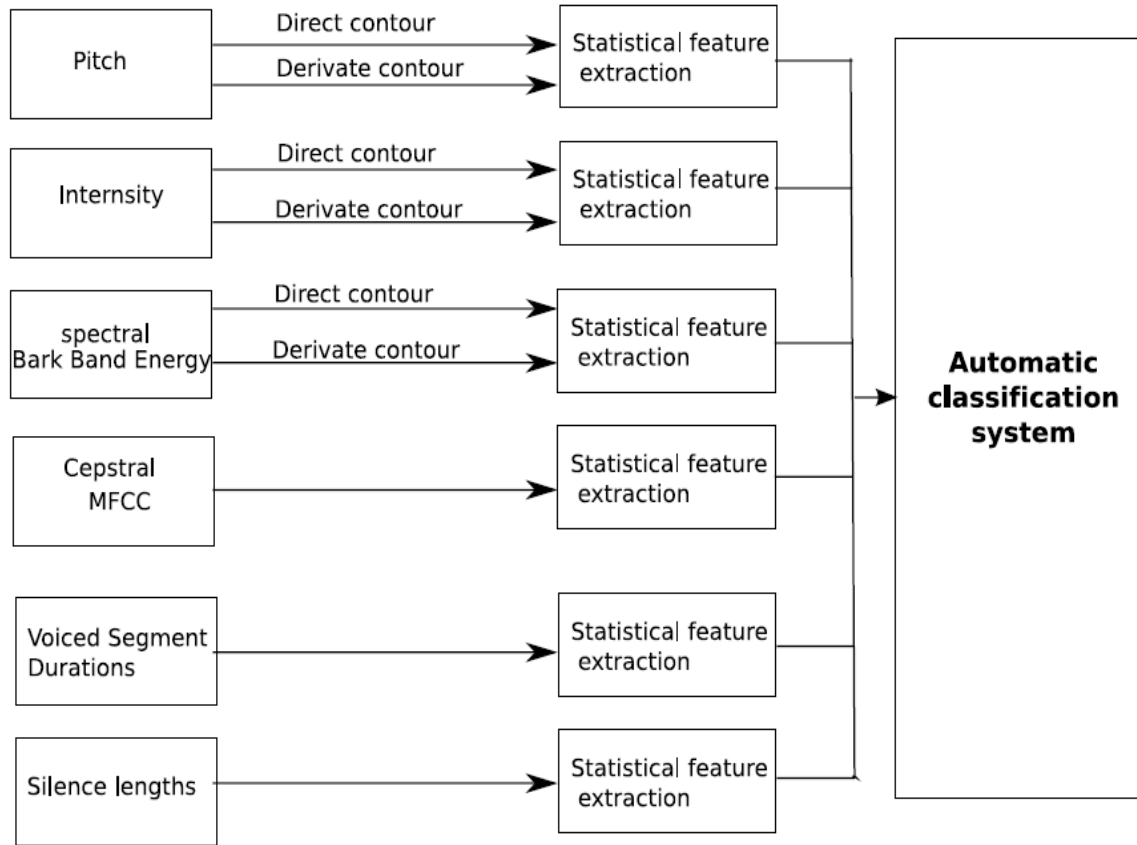


Speech Emotion Recognition

Tree diagram for types of Features:

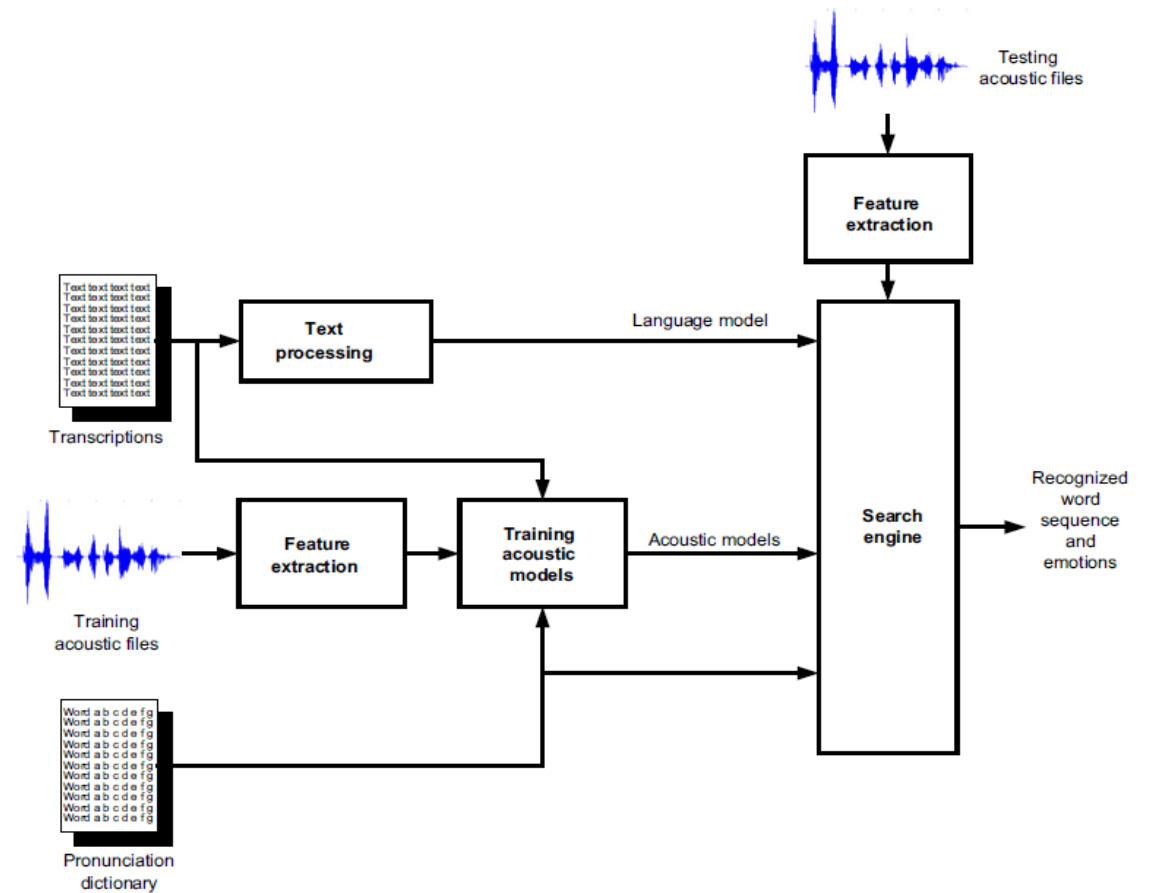


ACOUSTIC ANALYSIS



➤ Recognition Accuracy is 74.2%

COMBINING ACOUSTIC WITH LINGUISTIC ANALYSIS



➤ Recognition Accuracy is 59.6% (only Linguistic)

➤ Recognition Accuracy is 92% (Combination)

Applications

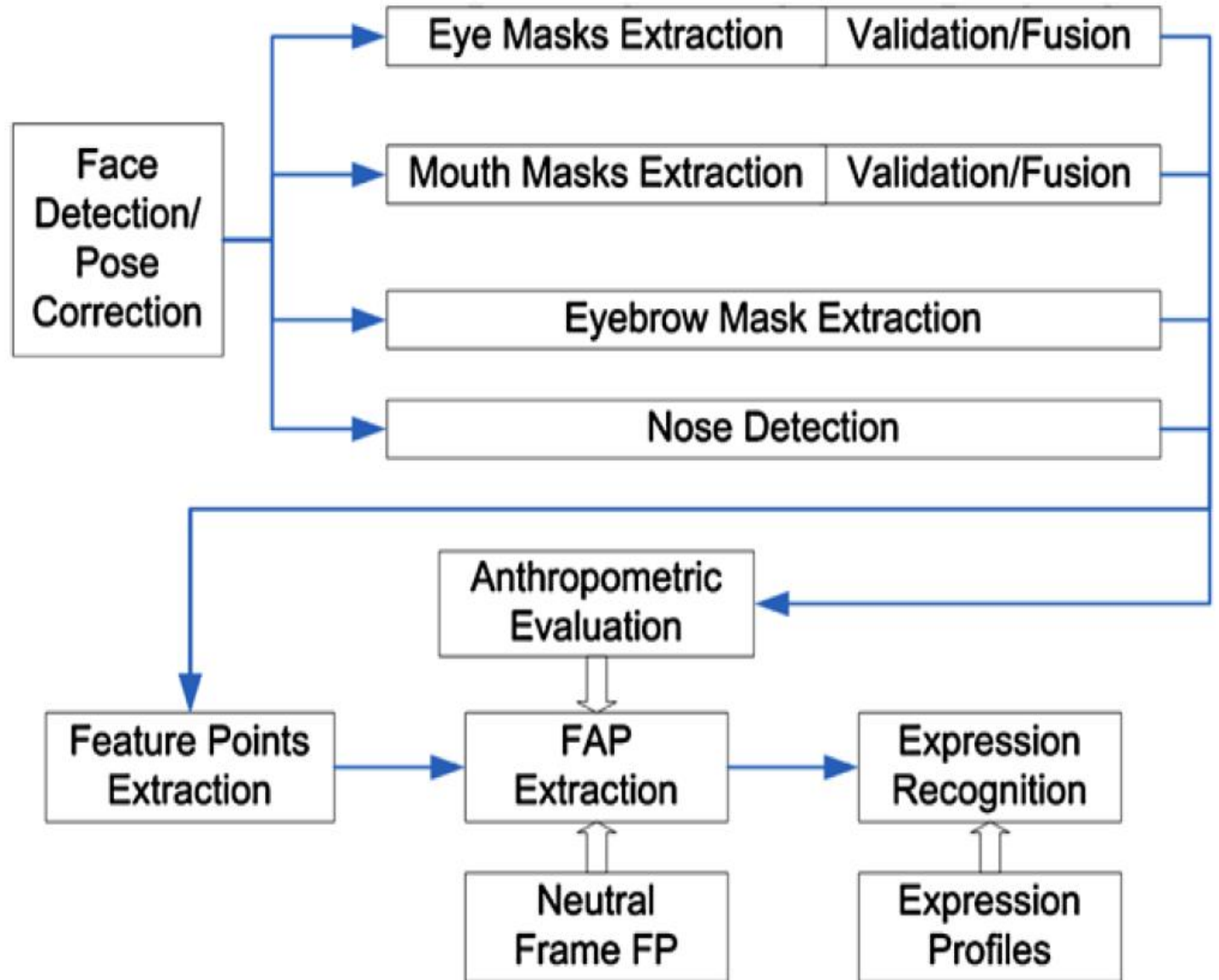
- ✓ Enable a natural interaction with the computer by speaking instead of using traditional input devices and not only have the machine understand the verbal content.

- Smart Call Centre
- Sorting voice mail
- Lie-detection
- Will improve intelligent assistant like Siri and google now

Etc.

Facial Emotion Recognition

- Contain major emotion information
- Efficient Dataset Available



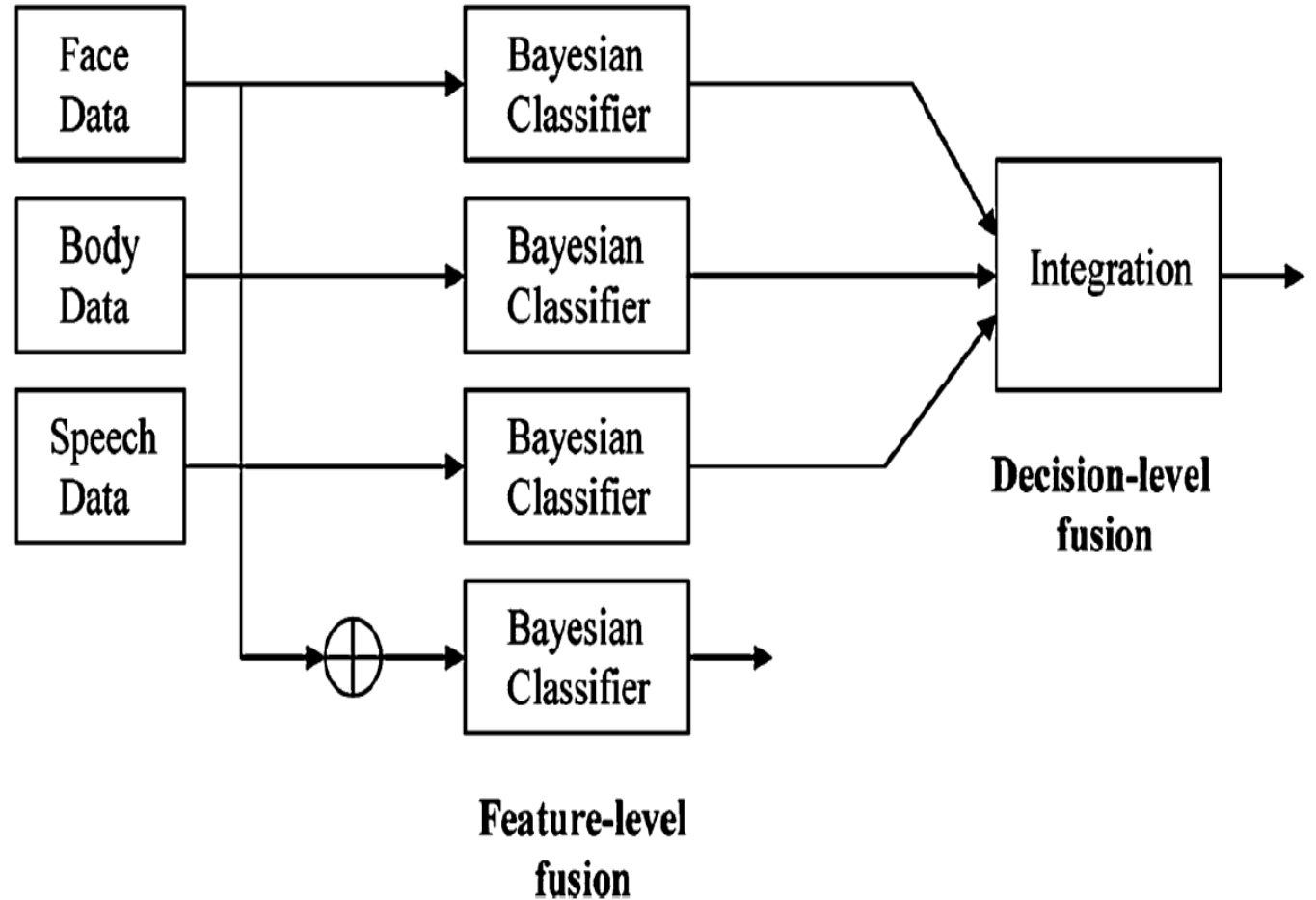
Applications

- Intelligent Online tutoring system
 - Detecting Emotions of Driver
 - Smart Computer/ Mobile interface
- Etc.

Multi-modal Emotion Recognition

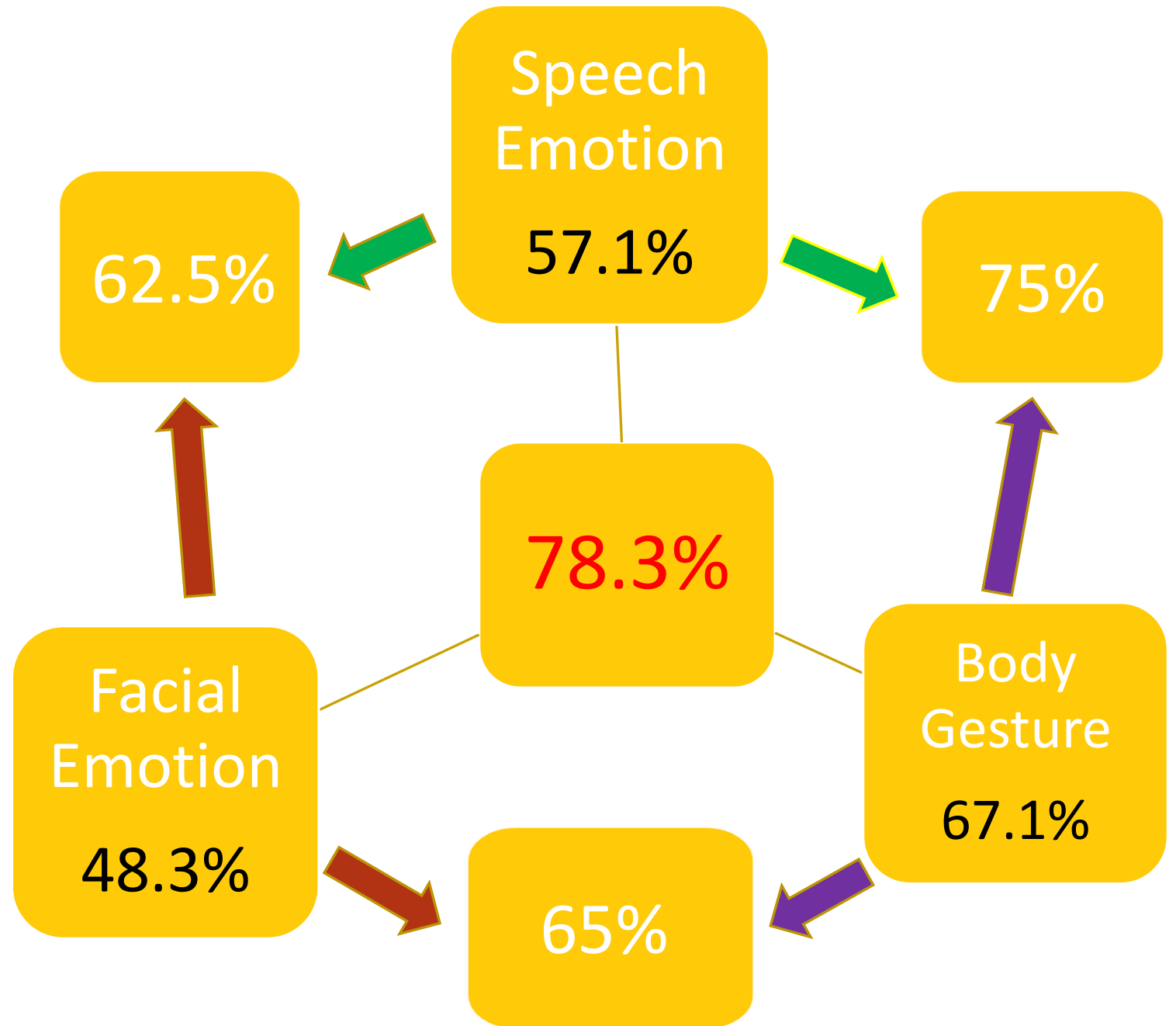
L. Kesseus multimodal Emotional recognition

- acoustic analysis for speech emotion recognition
- best probability approach for decision level fusion
- overall performance of system improved
- No universal dataset Available



Overall Performance Comparison of Uni-modal, Bi-modal and Multi-modal systems

Percentage of instances correctly classified in different modals in L. Kesseus experiment.



Current Technologies



An artificial intelligence startup that can read your mind. It predicts attitudes and actions based on facial expressions. It is used by advertisers to monitor and assess reactions to their ads and products from potential customers.

:) **Affectiva**

Developed a way for computers to recognize human emotions based on facial cues.

Affectiva's technology can enable applications to use a webcam to track a user's smirks, smiles, frowns and furrows, which measures the user's levels of surprise, amusement or confusion.

Emovu Driver Monitor System (Eyeris)



Emovu DMS analyzes driver emotions using a camera and a deep learning network.

Eyeris

Feeling sad, angry? Your future car will know.

It determine if that driver is angry, sad, happy, surprised, fearful, disgusted or expressing no emotion.

Some of the features of Emovu DMS

- Fear reaction when the brakes are applied.
- Sleepy while driving
- Pre-crash actions, such as tightening seat belts or preparing braking
- Correlating driver emotions to particular location.

An autonomous car of the future could actually take over the driving if it felt its human wasn't up to the task.

References:

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- II. S. Ramakrishnan, "Speech emotion recognition approaches in human computer interaction." Springer Science+Business Media, LLC 2011, 2nd September 2011
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