Screening Autism in Toddlers

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MVA Master Thesis

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Problem: Design an App to Screen for Autism

- An hot issue

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  - **ML Doctor Assistance**: a future breakthrough for medicine?

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- The data

Videos triggering specific behaviors   Algorithms to analyze kid response

General Approach: Behavior Analysis

- Face Analysis

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  - Muscle Contraction $\rightarrow$ **Instant Feelings**
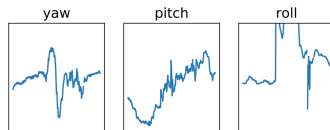
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  - Muscle Contraction $\to$ Instant Feelings $\to$ Psychological Screening
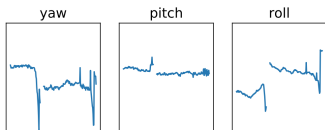
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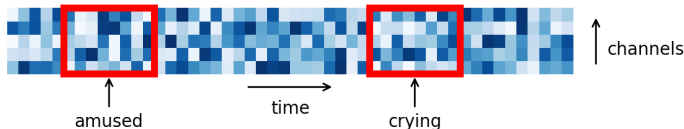- **Random Process** Classification

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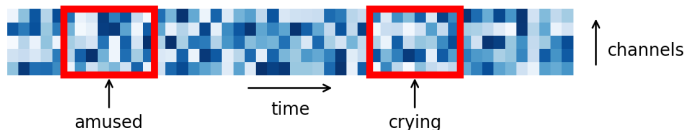

- Behavioral Perspective

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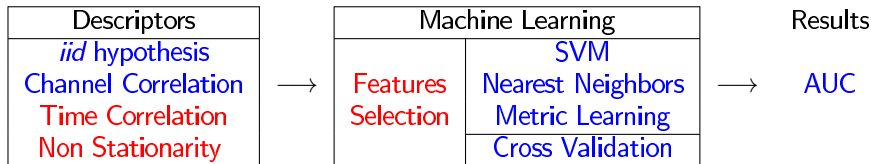- **Random Process** Classification

- Behavioral Perspective

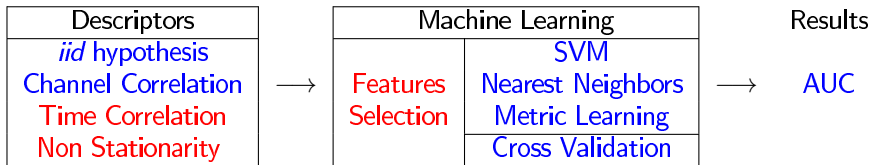Recognize behaviors as words (**BoW**) or through filtering (**CNN**)

Current Effort

- Characterization of Dynamics

Descriptors	Machine Learning	Results

Descriptors
iid hypothesis
Channel Correlation
Time Correlation
Non Stationarity

$\longrightarrow$

Machine Learning	
Features Selection	SVM
	Nearest Neighbors
	Metric Learning
	Cross Validation

$\longrightarrow$

AUC

Current Effort

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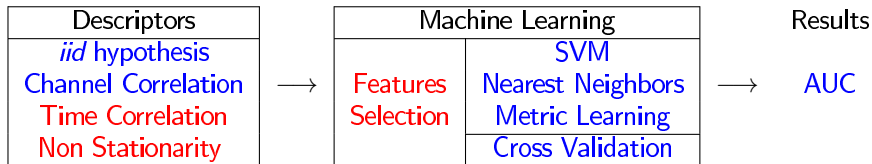| Descriptors		Machine Learning		Results
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Channel Correlation	$\longrightarrow$	Features	Nearest Neighbors	$\longrightarrow$ AUC
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  - **CNN**: few data but little architecture
  - **BoW** Descriptors (eventually with **DTW**)

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Results

AUC

- Behavioral Analysis
  - ○ **CNN**: few data but little architecture
  - ○ **BoW** Descriptors (eventually with **DTW**)
- Results:
  - ○ 90 % MCHAT: questionnary for parent to answer
          Recall : 97 %,   Precision : 50 %
  - ○ 80 % Us with really simple features

Thank you for your attention!

- Further readings...

📄 J. Hashemi and others — *A scalable app for measuring autism risk behaviors in young children: A technical validity and feasibility study*, 2016

📄 C. Darwin — *The Expression of the Emotions in Man and Animals*, 1872

📄 P. Ekman and others — *Facial Action Coding System: A Technique for the Measurement of Facial Movement*, 1978

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- Take Home Message:

Hot Subject, Interesting Ideas, a lot to be done...
Plenty of Collaboration Opportunities!!!