Assignment 1

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In this opening keynote, Prof. Jean Julien-Aucouturier talks about their research journey and experience in the fields of MIR and neuroscience Music Information Retrieval deals with retrieving and organising information from music, where as neuroscience involves studying the brain and cognitive functions.

Music Information Retrieval or MIR consists of signal processing, machine learning and sound synthesis. On the other hand, the field of neuroscience encompasses subfields such as psychoacoustics, cognitive psychology, music cognition and cognitive neuroscience. He also highlights a few lessons learnt by him after working in both the fields for more than a decade.

- Building proof on machine result vs building proof on the information available-

  Building proof on machine results puts a lot of emphasis on the output, instead of the mechanisms and the process, which is very important from a neuroscience perspective. This provides more information about the algorithm and not enough information on human cognition. So instead of building proofs based on machine results, building proof based on the information available by using the machine learning algorithms to reason about the stimulus available to the machine to do the task as enough information exists in the signal that is enough to simulate the task.

- Using signal features to explain human judgements vs Using signal to explain cognitive features-
  The features obtained from the signal explain the data and correlate with the results, but one cannot derive any psychological information from the results obtained because of the features utilised. This is because such features are not designed to emulate processes in the brain so it not possible to directly coordinate brain activity with audio features such as MFCCs. A better approach would be to use the signal processing features to explain human intermediate cognitive features, which then can explain the resultant human behaviours. This helps in modelling and characterising human behaviours so that they are measurable.

- Explaining using an analysis method vs building generative models to transform data/building transformative models -
  Explaining using an analysis method is essentially obtaining a proof by correlation, but correlation does not necessarily imply causality. This would mean that the study would not provide any mechanistic insights. The solution to this would be building generative/transformation models so that the impact of acoustic properties on cognition can be observed causally.

Understanding how to build scientific proof that is valid in the fields of biology and cognitive science using MIR tools is essential. MIR tools can be utilised to obtain features that can be used to indirectly explain human behaviours, by correlating them with intermediate human judgements that would then explain the human behaviours. The keynote also addresses the key differences in how the both groups approach research. Both fields involve studying how our brains perceive sound and music with methodologies that are vastly different. MIR includes signal processing and machine learning and neuroscience on the other hand involves understand the biology of the brain and in this context, how it handles sound, voice and music. Anyone with a computer science and MIR background attempting to study neuroscience will be faced with a completely new vocabulary, tools and analysis techniques and methodologies. On the other hand, someone with a biology/neuroscience background come across different tools, math and various algorithms. Both these fields also have differences in what they consider if a scientific result is worthy of publication. As seen above, cognitive neuroscience as a field is not interested in the results of the studies but rather the mechanism and process involved in obtaining the said results.