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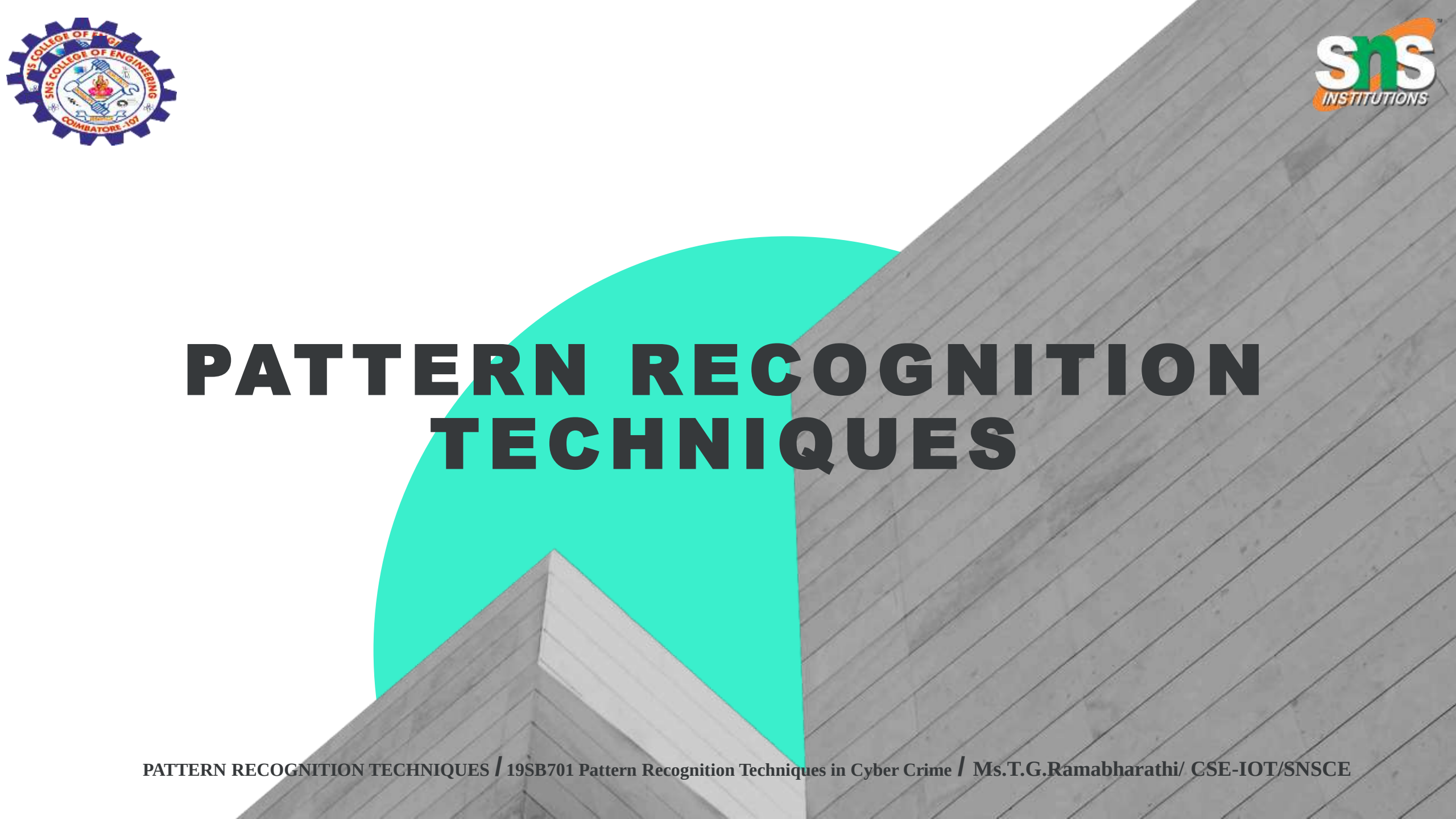
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING-IOT Including CS&BCT

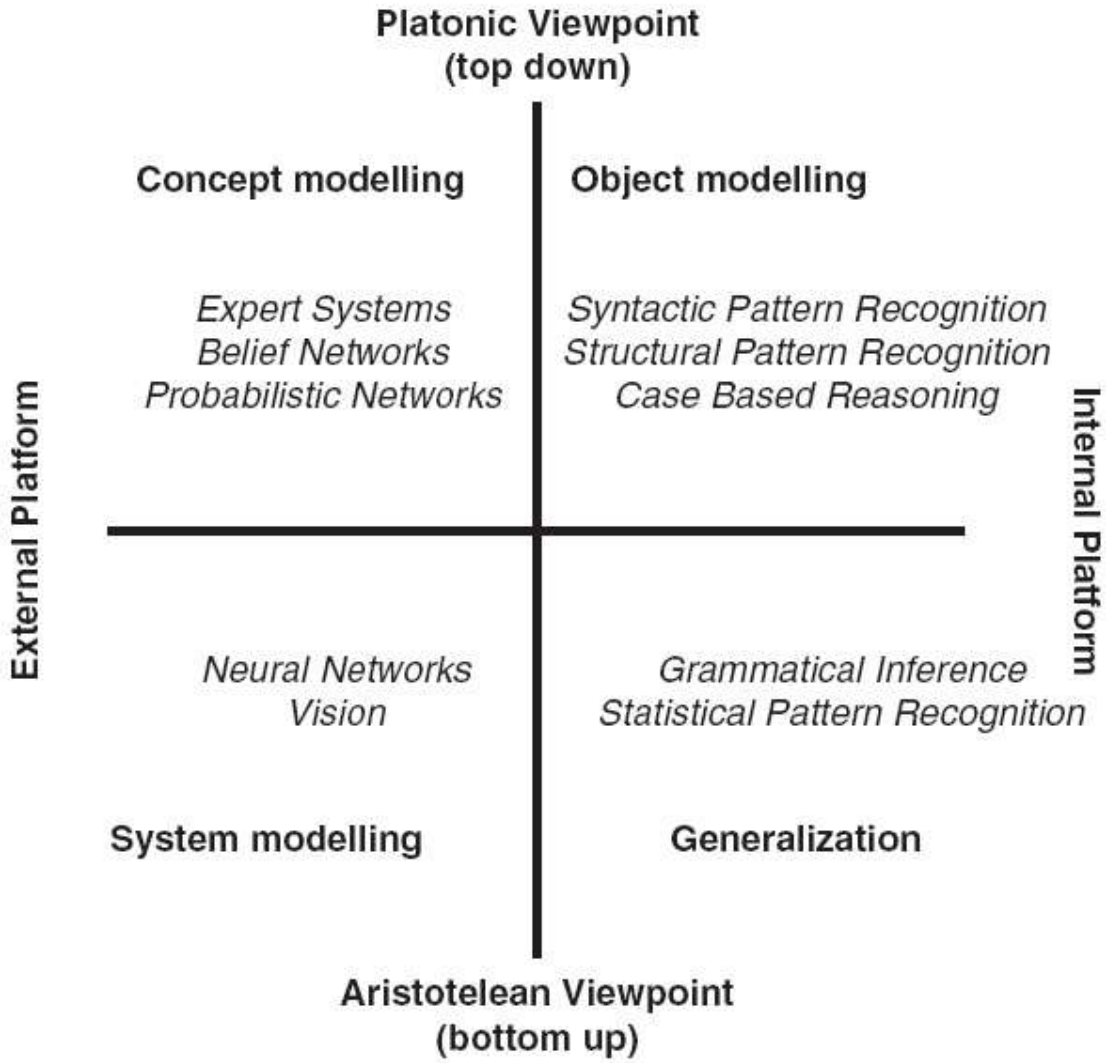
COURSE NAME :19SB701 Pattern Recognition Techniques in Cyber Crime

IV YEAR / VII SEMESTER
Unit I - INTRODUCTION
Topic : PATTERN RECOGNITION TECHNIQUES



PATTERN RECOGNITION TECHNIQUES

FOUR APPROACHES TO PATTERN RECOGNITION



PLATONIC AND ARISTOTELIAN VIEWPOINTS

- Two principally different approaches to almost any scientific field rely on the so-called Platonic and Aristotelian view points.
- In a first attempt they may be understood as top-down and bottom-up ways of building knowledge.
- They are also related to deductive (or holistic) and inductive (or reductionistic) principles.
- The Platonic approach starts from generally accepted concepts and global ideas of the world. They constitute a coherent picture in which many details are undefined.
- The primary task of the Platonic researcher is to recognize in his observations the underlying concepts and ideas that are already accepted by him.
- Many theories of the creation of the universe or the world rely on this scenario. An example is the extinction of the mammoths.
- For the Platonic researcher, however, it is not an extrapolation, but an adaptation of previous formulations of the theory to new facts.
- That is the way this approach works: existing ideas that have been used for a long time are gradually adapted to new incoming observations.
- The change does not rely on an essential paradigm shift in the concept, but on finding better, more appropriate relations with the observed world in definitions and explanations.

PLATONIC AND ARISTOTELIAN VIEWPOINTS

- The observations are of primary interest in the Aristotelian approach.
- Scientific reasoning stays as close as possible to these. It is avoided to speculate on large, global theories that go beyond the facts.
- The observations are always the foundation on which the researcher builds his knowledge.
- Based on them, patterns and regularities are detected or discovered, which are used to formulate some tentative hypotheses.
- These are further explored in order to arrive at general conclusions or theories.
- As such, the theories are not global, nor do they constitute high level descriptions.
- A famous guideline here is the principle known as Occam's razor.
- It urges one to avoid theories that are more complex than strictly needed for explaining the observations.
- Arguments may arise, e.g. because the definition of complexity depends on the mathematical formalism that is used.

INTERNAL VERSUS EXTERNAL OBSERVATIONS

- In the contemporary view science is ‘the observation, identification, description, experimental investigation, and theoretical explanation of phenomena or
- ‘any system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation’.
- So, the aspect of observation that leads to a possible formation of a concept or theory is significant.
- Consequently, the research topic of the field of pattern recognition, which aims at the generalization from observations for knowledge building, is indeed scientific.
- Science is in the end a brief explanation summarizing the observations achieved through abstraction and their generalization.
- Such an explanation may primarily be observed by the researcher in his own thinking.
- We all carry the generalization ability inside us. Pattern recognition research can thereby be performed by **introspection.**

INTERNAL VERSUS EXTERNAL OBSERVATIONS

- We can also observe pattern recognition in action by observing other human beings (or animals) while they perform a pattern recognition task, e.g. when they recognize an apple.
- Now the researcher tries to find out by experiments and measurements how the subject decides for an apple on the basis of the stimuli presented to the senses.
- He thereby builds a model of the subject, from senses to decision making. It is **an external approach**.
- Both these approaches result into a model.
- In the external approach, however, the senses will be included in the model.
- In the internal approach, this is either not possible or just very partially.
- We are usually not aware of what happens in our senses.
- Introspection thereby starts by what these senses offer to our thinking (and reasoning).
- As a consequence, models based on the internal approach have to be externally equipped with (artificial) senses, i.e. with sensors.

THE FOUR APPROACHES

- The above two dichotomies result in four approaches:
- **Introspection by a Platonic viewpoint:** object modeling. This is the topic studied by structural pattern recognition.
- **Introspection by an Aristotelian viewpoint**: generalization. This is the topic studied by statistical pattern recognition.
- **Extrospection by an Aristotelian viewpoint**: system modeling. This is the topic studied by neural networks and neuroscience.
- **Extrospection by a Platonic viewpoint**: concept modeling. This is the topic studied by expert systems.

THANK YOU

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