DEEP QUEUE LEARNING

DEEP NEURAL NETWORK + Q-FUNCTION
REINFORCEMENT LEARNING

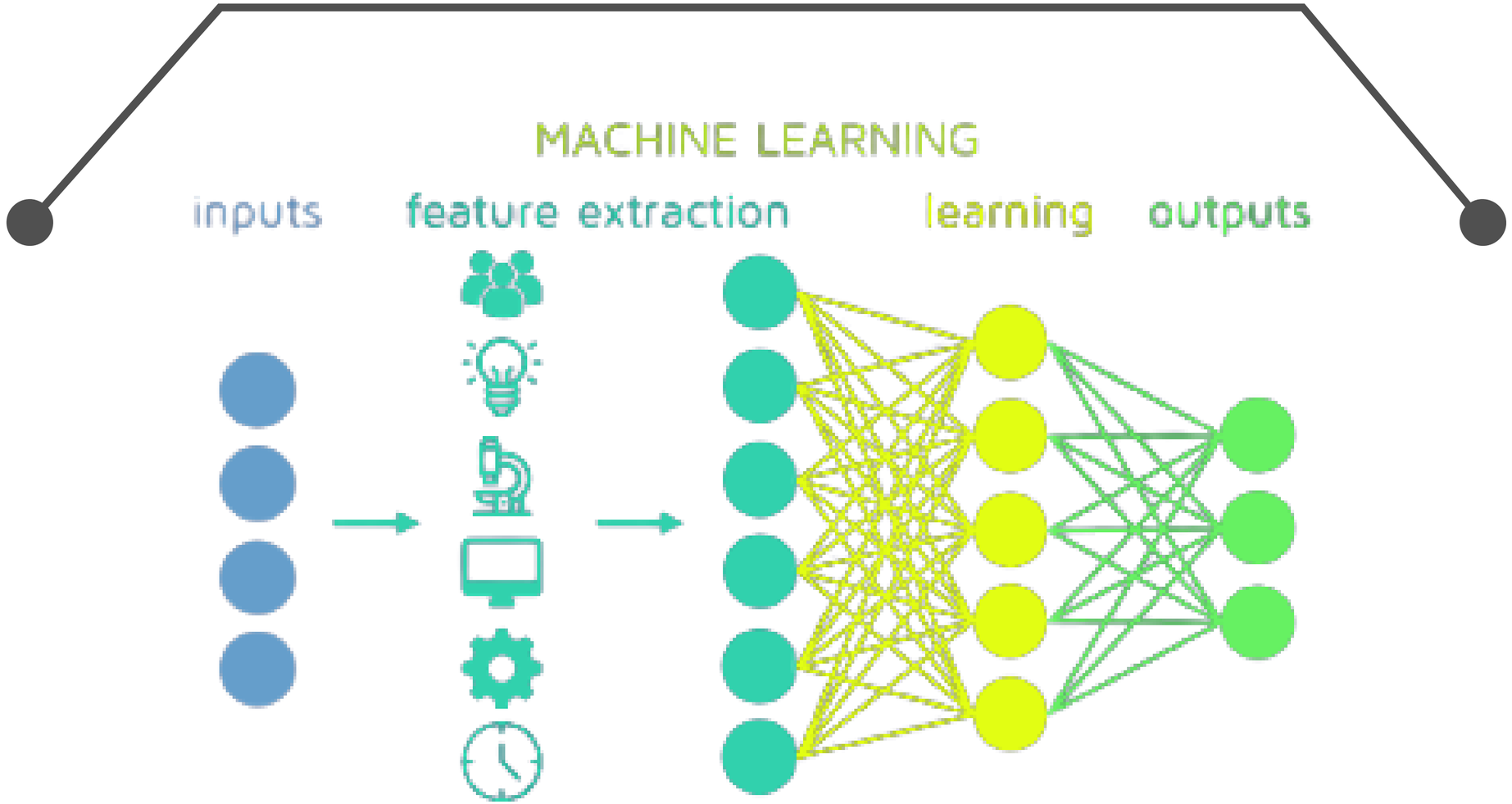
CHAPTER 1

A BIT OF THEORY

PART 1

1.1

MACHINE LEARNING


MACHINE LEARNING
inputs
feature extraction
learning
outputs

MACHINE LEARNING:
COMPUTERS LEARN FROM DATA RATHER THAN BEING EXPLICITLY PROGRAMMED.

TRAINING DATA:
EXAMPLES OF DATA WITH EXPECTED RESPONSES (LABELS) TO TEACH THE MODEL.

MODEL:
ALGORITHM OR MATHEMATICAL STRUCTURE THAT MAKES PREDICTIONS OR CLASSIFICATIONS. (EG. MONTERCARLO TREE SEARCH)

TRAINING:
FITTING THE MODEL TO THE TRAINING DATA BY MINIMISING A COST FUNCTION.

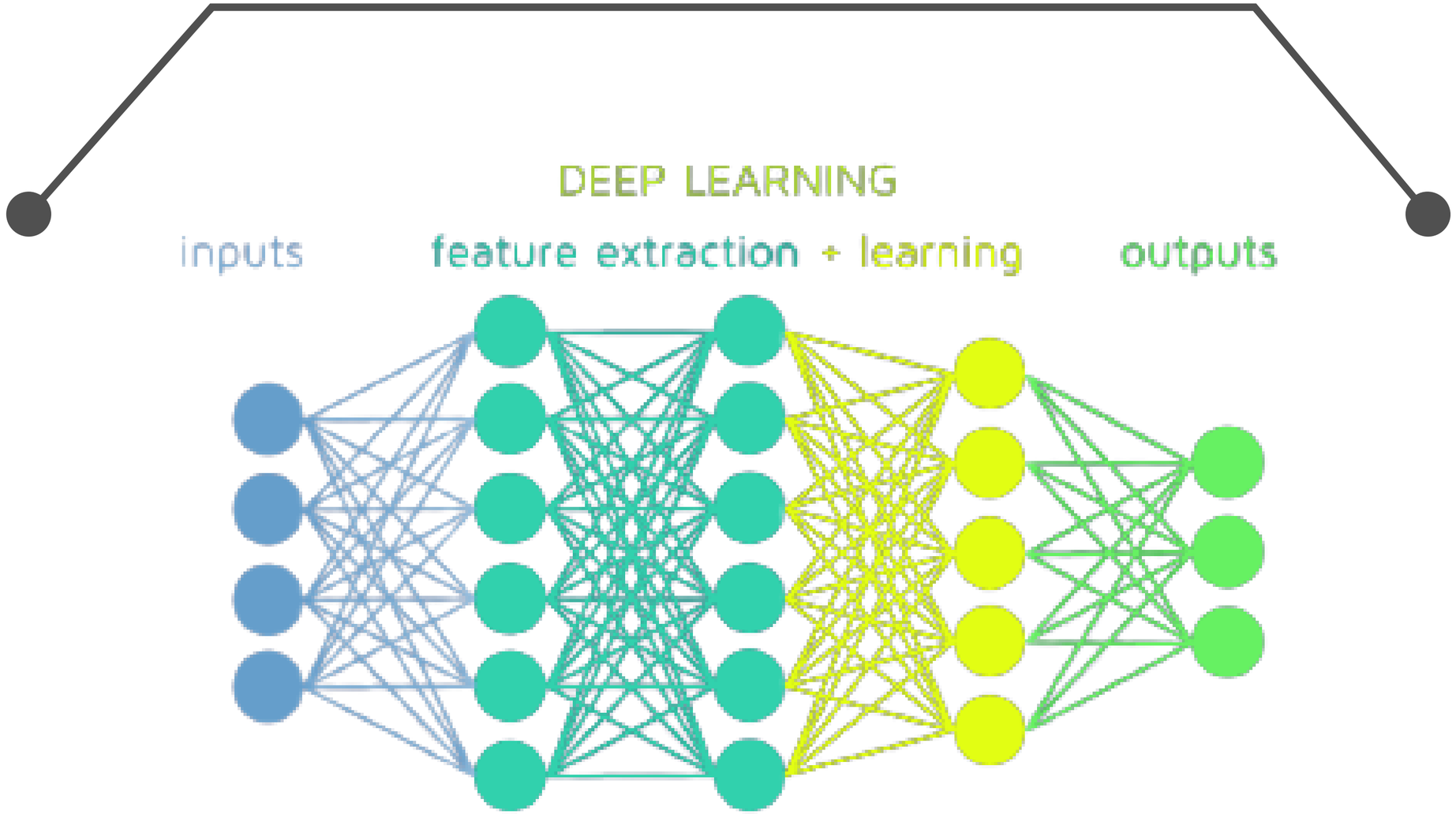
VALIDATION:
EVALUATION OF THE MODEL ON A SET OF VALIDATION DATA TO ENSURE GENERALISATION AND ACCURACY ON NEW DATA.

OVERLEARNING:
EXCESSIVE ADAPTATION TO TRAINING DATA, RESULTING IN POOR GENERALISATION.

DIVERSE APPLICATIONS:
VARIOUS USES OF MACHINE LEARNING, SUCH AS IMAGE RECOGNITION, MACHINE TRANSLATION, FRAUD DETECTION, ETC.

PART 2

DEEP LEARNING


DEEP LEARNING
inputs
feature extraction + learning
outputs

REINFORCEMENT LEARNING (DQL)
- AGENT INTERACTION, ACTIONS AND REWARDS TO MAXIMISE PERFORMANCE

Q-LEARNING
- ESTIMATING THE VALUE OF SHARES IN A STATE

DEEP NEURAL NETWORKS
USED TO APPROXIMATE THE Q FUNCTION
- MANAGING COMPLEX PROBLEMS AND MASSIVE DATA

APPROXIMATE Q FUNCTION
- USE OF A NEURAL NETWORK
- STATE AND ACTION INFLUENCE THE VALUE

EXPLORATION AND EXPLOITATION
- BALANCING THE DISCOVERY OF NEW ASSETS WITH THE EXPLOITATION OF SUCCESSFUL STOCKS.

AGENT EXPERIENCE: INTERACTION OF THE AGENT WITH THE ENVIRONMENT TO COLLECT EXPERIENCE DATA AND UPDATE ITS APPROXIMATE Q FUNCTION.

REWARDS: THE AGENT RECEIVES REWARDS FOR HIS ACTIONS AND SEEKS TO MAXIMISE THE SUM OF THESE REWARDS OVER THE LONG TERM.

BATCH LEARNING: USING BATCHES OF EXPERIENCE COLLECTED OVER TIME TO REINFORCE LEARNING STABILITY.

COMPLEX PROBLEMS: EFFECTIVENESS OF DQL IN SOLVING COMPLEX PROBLEMS SUCH AS AUTONOMOUS NAVIGATION, VIDEO GAMES, ROBOTICS, ETC.

CHALLENGES: LEARNING STABILITY, DIVERGENCE MANAGEMENT, SELECTION OF NEURAL NETWORK ARCHITECTURES AND HYPERPARAMETERS ARE ALL CHALLENGES TO BE MET WITH DQL.

CHAPTER 2

LET'S PRACTICE !

PART 1

2.1

THE GAME

PART 2

2.2

THE AI