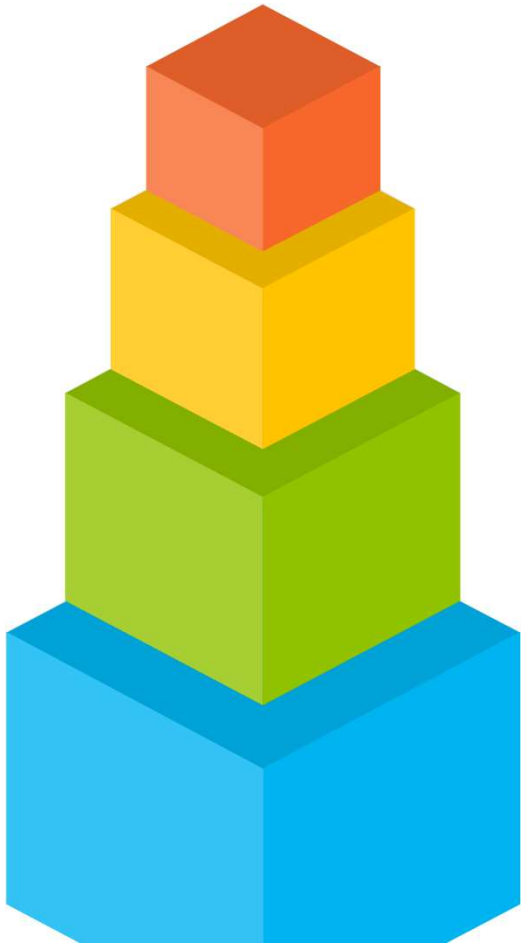
# Modeling using Multiagent Systems

Prof. Iván Axel Dounce Nava



# Abstract


- Today we will learn what is an agent, some of its properties, and its fundamental mathematical description.

# Who Am I?

- Mechatronics Engineering (La Salle University)
  - Work on a Flexible Micro-Robotic Arm Using NiTiNOL
- Master in Computer Science (CINVESTAV, Guadalajara)
  - Work on: Biologically Inspired Perceptual Object Recognition System
- PhD in Computer Science (CINVESTAV, Guadalajara)
  - Work on: Ambiguous Object Perceptual Identification With Contextual Scenes
- PhD Internship (University of Tartu, Estonia)
  - Work on: Mechanism For Abstract Navigation Using Mental Rotations

- Contact me at: axel.dounce@tec.mx
  - For any question or tutoring

# Who Are You?

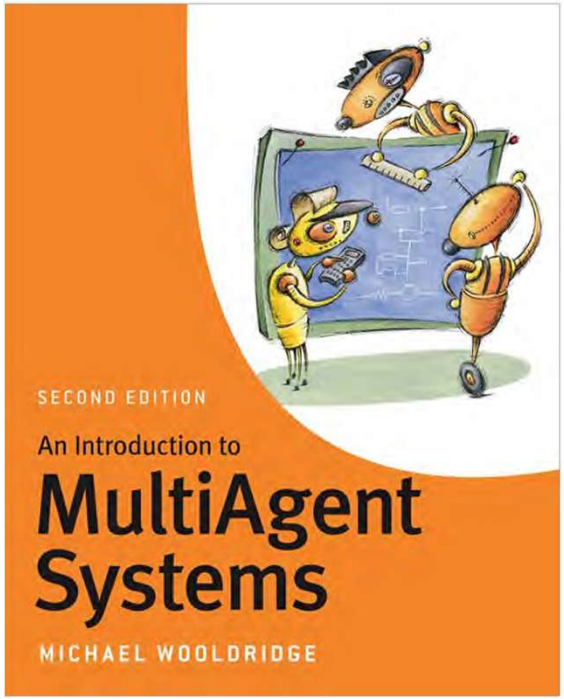
1. Your name
2. What do you expect for this topic
3. Your favorite book (or videogame or tv series, if you don’t have one)

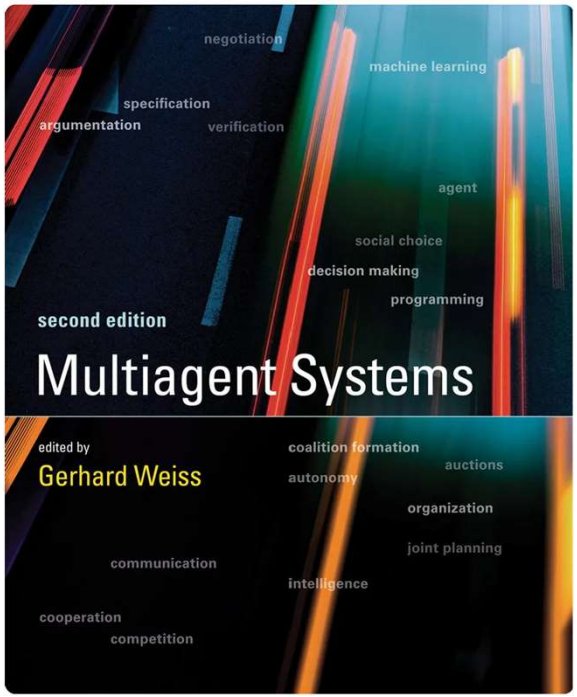
# What are we going to Learn?

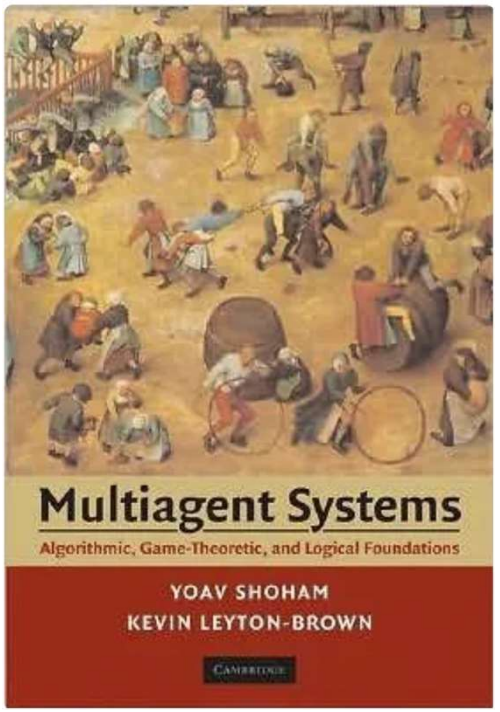
- Week 1:
  - Intelligent Agents
- Week 2:
  - Agent Communication
- Week 3:
  - Agent Interaction and Decision Making
- Week 4:
  - Distributed Learning

# Resources

## Books and scientific papers



# How will you be graded?

- Multiagent systems = 22%
  - Quizzes = 22%
- Computer Graphics = 22%

- Final Evidence = 56%

# Class Schedule

Monday to Thursday
From 4:00pm to 6pm:00

Class starts 10min after start
Class ends10min before end

Ready to start this exiting topic?!

# Intelligent Agents

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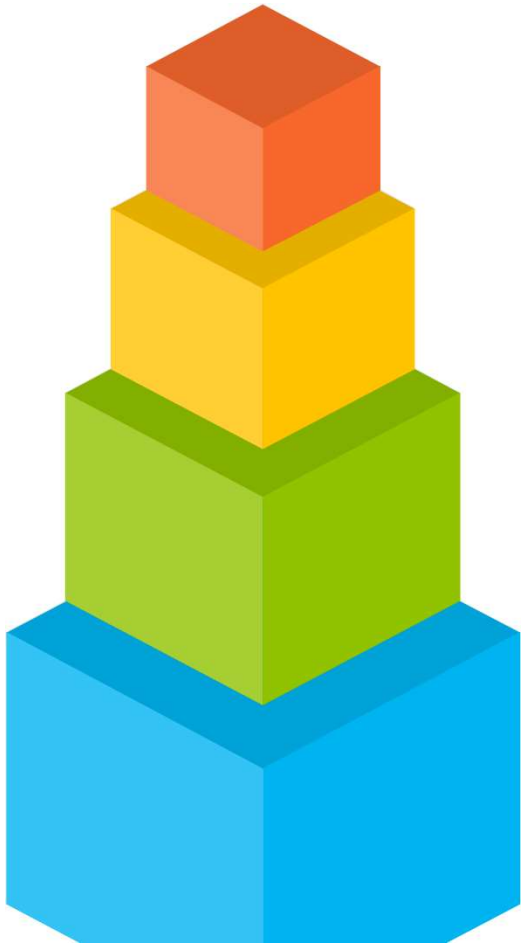


# Overview

1. Background
2. ¿What is an agent?
3. Abstract Architectures
4. Performance metrics
5. Agent synthesis



# 1. Background

How did technology encounter agents?



# Trends towards Multiagent Systems

- Ubiquity:
- Interconnection
- Intelligence
- Delegation
- Human Orientation



# Trends towards Multiagent Systems

- Ubiquity:
  - The increasing computing capacity using continuously decreasing costs, on a variety of small places.
- Interconnection
  - Systems are connected to each other. They are distributed and constituted as networks.
- Intelligence
  - The complexity of tasks that we can automate with computers.
- Delegation
  - Giving control to computer systems.
- Human Orientation
  - Unlike machine-oriented, we develop systems with concepts towards the way humans see the world.



# Capabilities towards Multiagent Systems

- Delegation + Intelligence
  - Independent operation of systems
  - Representation of our best interests (interactions by design)
- Interconnection + Ubiquity
  - Cooperation between systems
  - Negotiation given different interests



# 2. What is an agent?

Approximating a definition

# General definition

An agent is a computer system that is **situated in some environment**, and that is capable of **autonomous action** in this environment in order to meet **its delegated objectives.**

- What does situated mean?
- What does autonomous mean?
- What does delegated objectives mean?

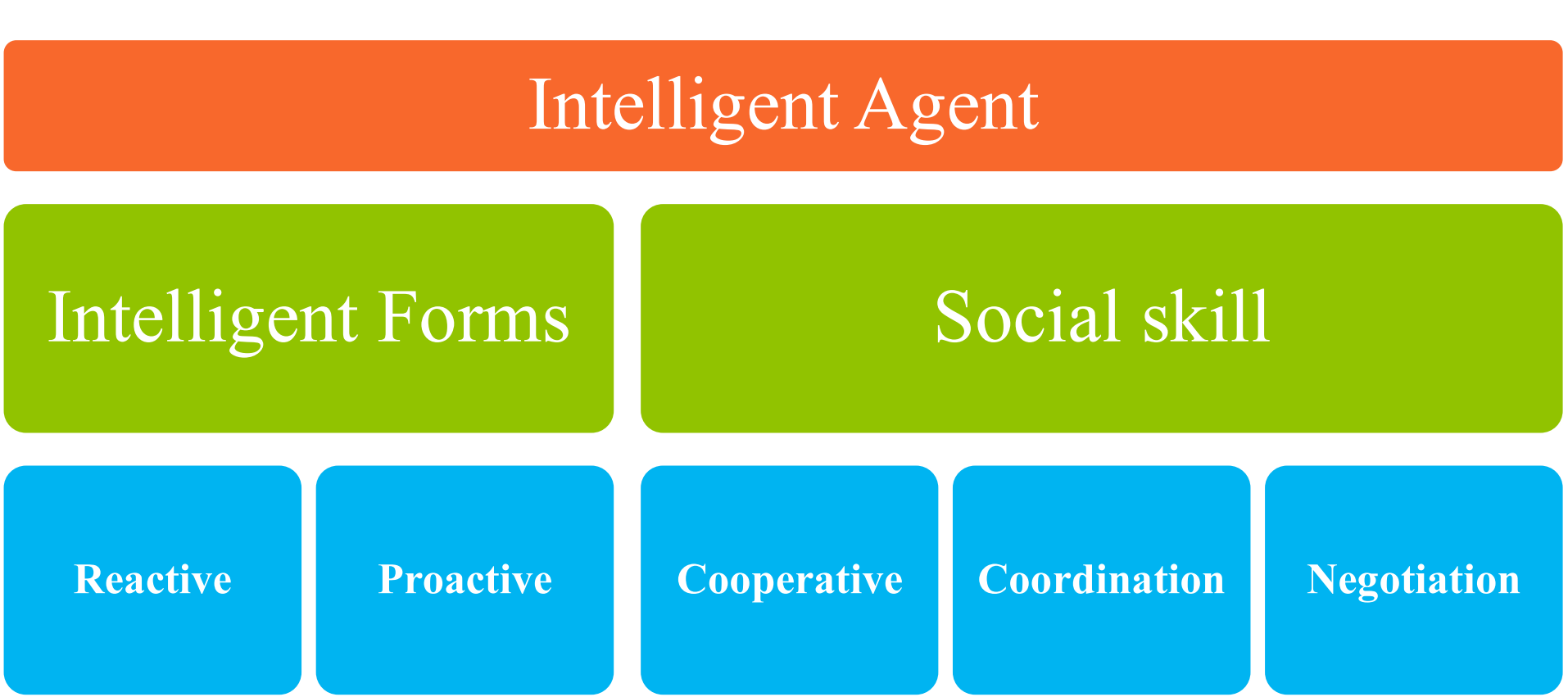


# Examples of Agents?

- A human
- Robot
- Light switch?
- A rock?
- ……?

# Simple general schematic of an intelligent agent

# Basic properties of an intelligent agent





# Properties for Intelligence forms

- Reactive:
  - Executes actions “without thinking”
  - Maintains a constant interaction with environment
  - Best on Static (Non-dynamical) environment
- Proactive:
  - Has initiative
  - Objective oriented
  - Takes presented opportunities

# Properties for Social skills

- Cooperation:
  - Working together to accomplish a common goal
- Coordination:
  - Management of shared resources between tasks
- Negotiation:
  - Reaching agreements for the common interests

## Basic properties of the agent's environment

# Agent's Environment

- Accessibility
- Determinism
- Dynamic
- Episodic
- Discrete



# Properties for Environments

- Accessible / Inaccessible
  - Is the information from the environment available for the agents?
- Deterministic / Non-deterministic
  - Each state precedes only one following state
- Dynamic / Static
  - Are objects in the environment changing?
- Episodic / Non-episodic
  - It is possible to divide all states in independent groups of states
- Discrete / Continuous
  - Can you count the number of states from the environment?