

# Artificial Cognitive Systems

## Module 4: Autonomy

### Lecture 1: Types of autonomy; robotic autonomy; strength and degree

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Adaptive autonomy  
Adjustable autonomy  
Agent autonomy  
Basic autonomy  
Behavioural autonomy  
Belief autonomy  
Biological autonomy  
Causal autonomy  
Constitutive autonomy  
Energy autonomy  
Mental autonomy  
Motivational autonomy  
Norm autonomy  
Robotic autonomy  
Shared autonomy  
Sliding autonomy  
Social autonomy  
Subservient autonomy  
User autonomy

...

[Vernon 2014]

# Autonomy



## **Autonomy:**

The degree of self-determination of a system

The degree to which

- A system's behaviour is not determined by the environment
- The degree to which a system determines its own goals

## Autonomy:

The degree of self-determination of a system

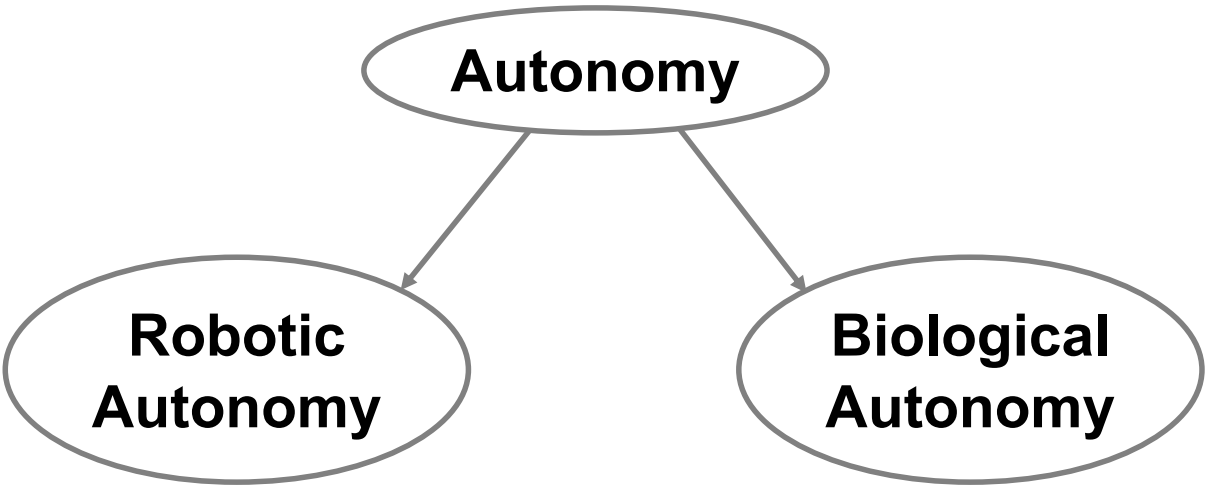
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- A system determines its own goals

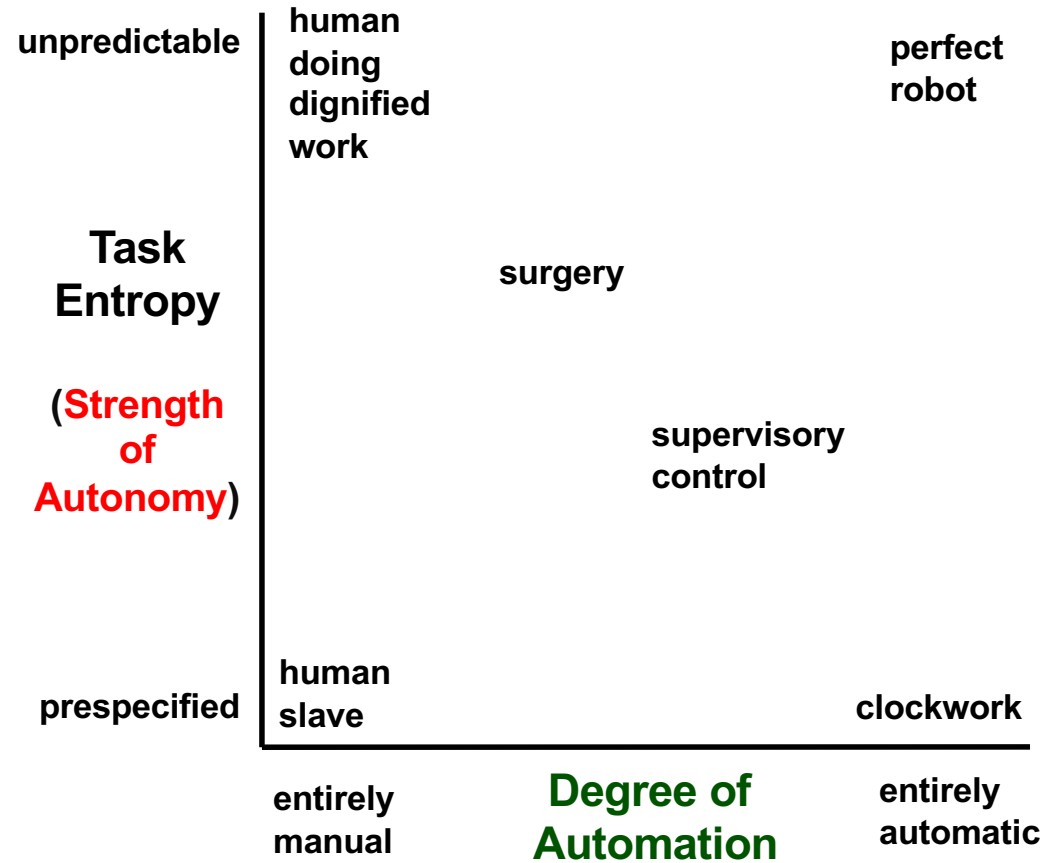
## **An autonomous system**

is not controlled by some external agency

but is self-governing and self-regulating to a greater or lesser extent

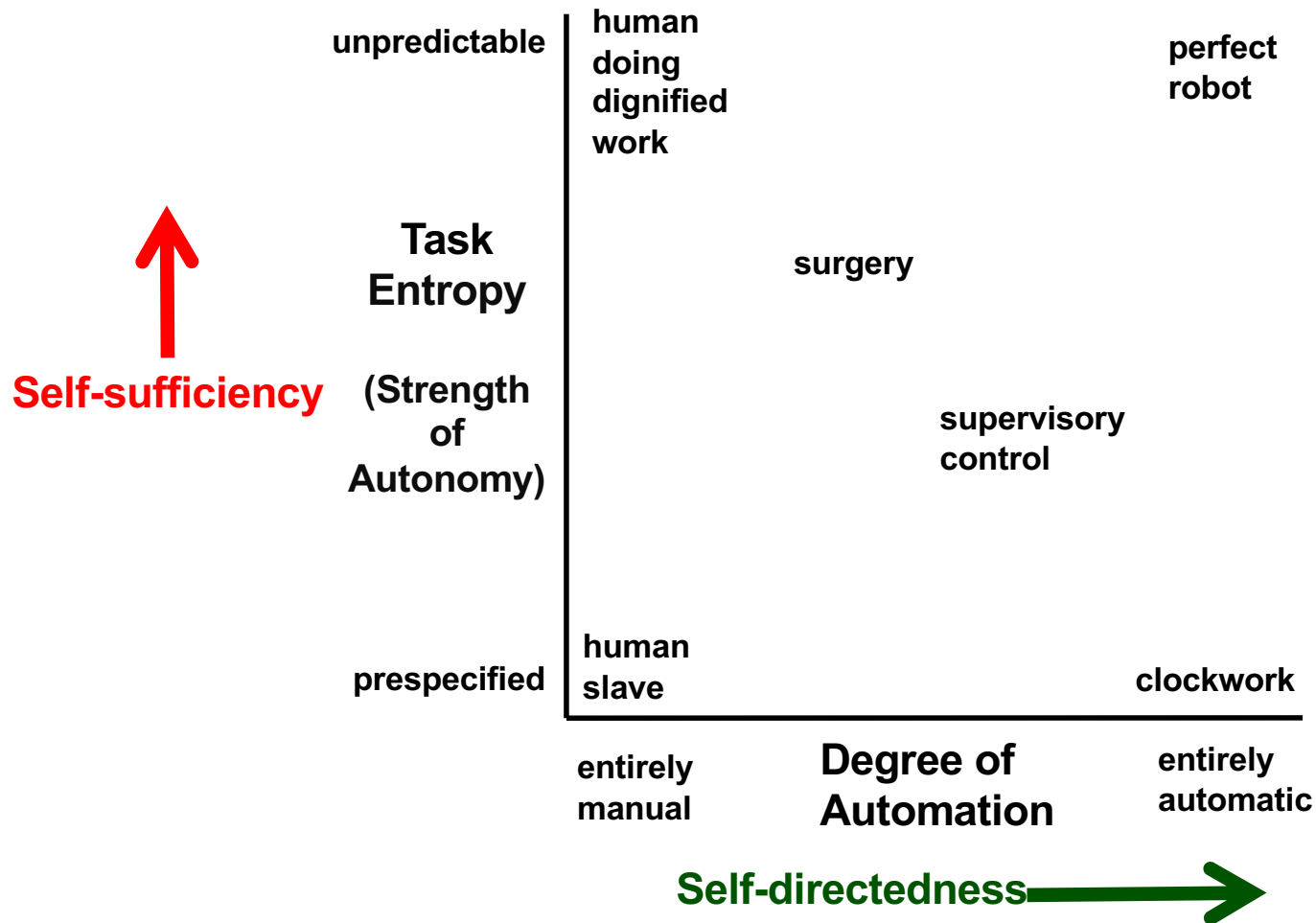


# Robotic Autonomy



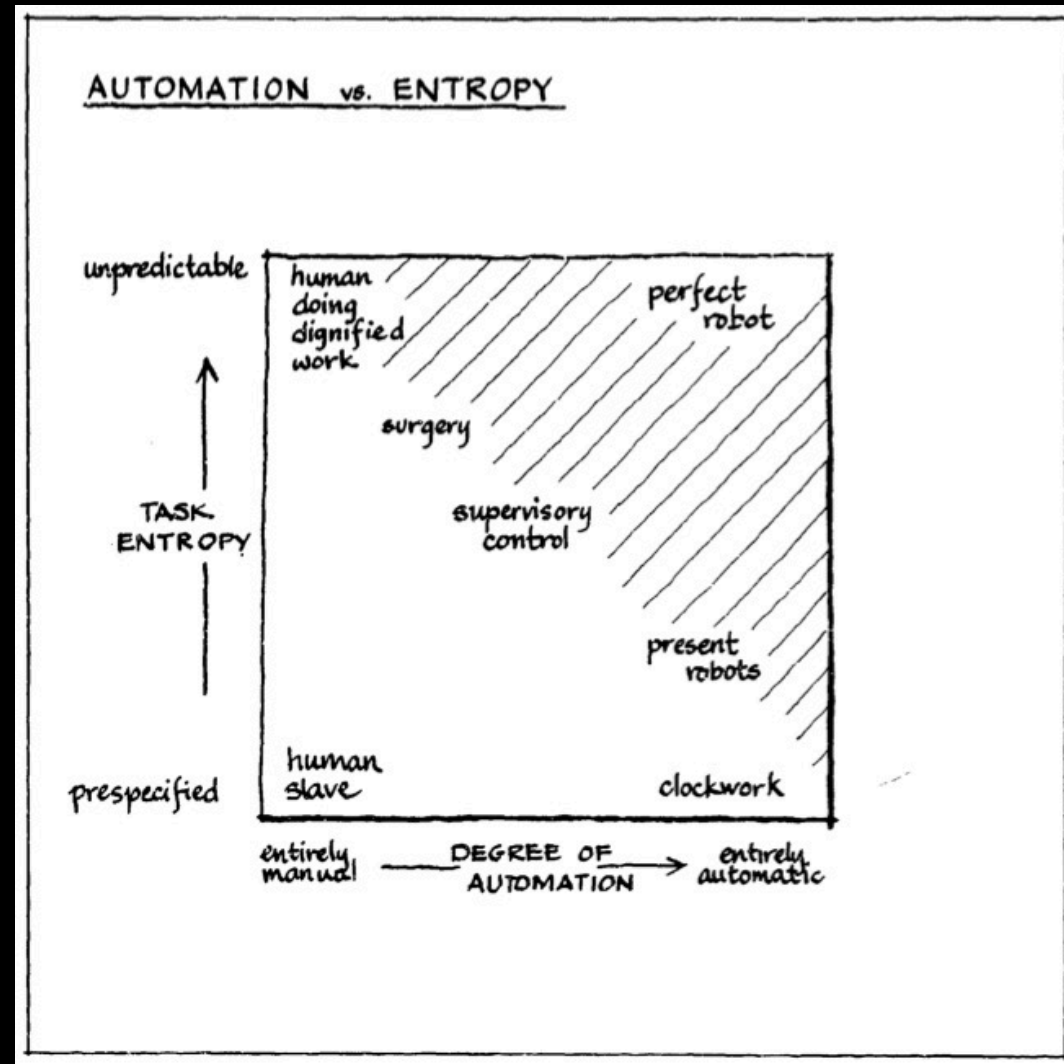
T. B. Sheridan and W. L. Verplank. Human and computer control for undersea teleoperators. Technical report, MIT Man-Machine Systems Laboratory, 1978.

# Robotic Autonomy

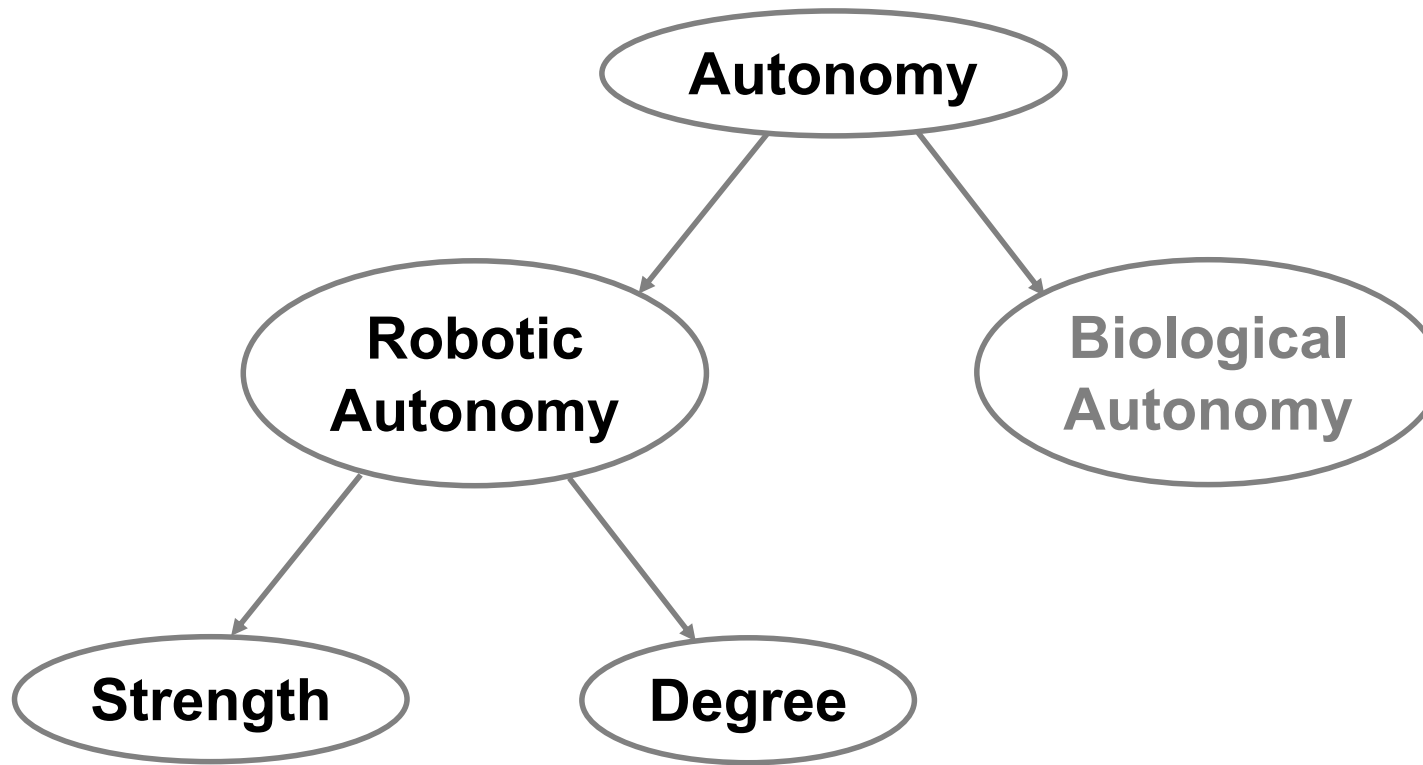


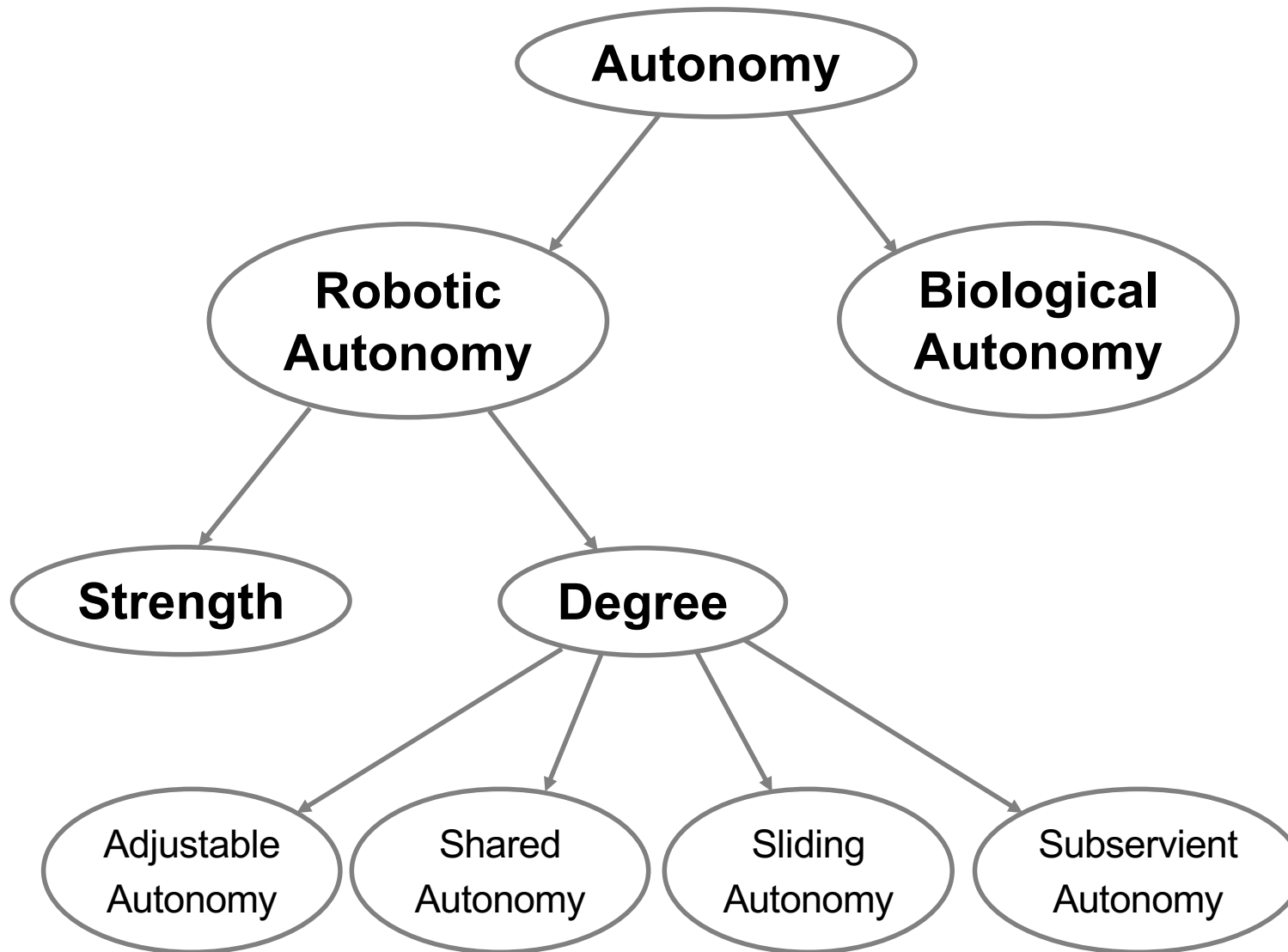
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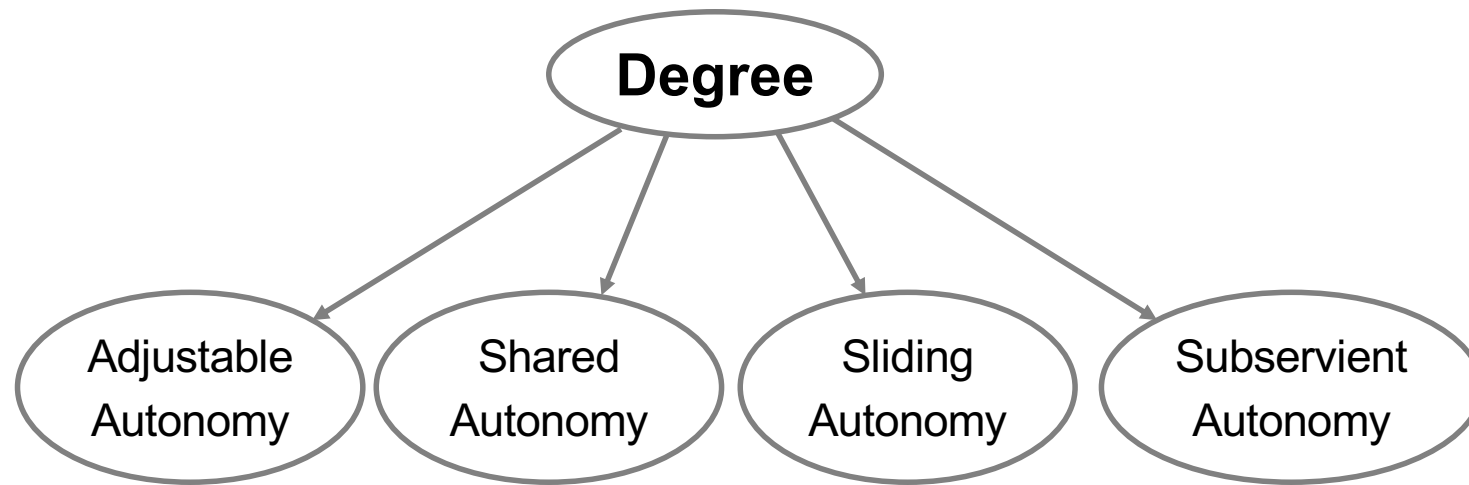




T. B. Sheridan and W. L. Verplank. Human and computer control for undersea teleoperators. Technical report, MIT Man-Machine Systems Laboratory, 1978.



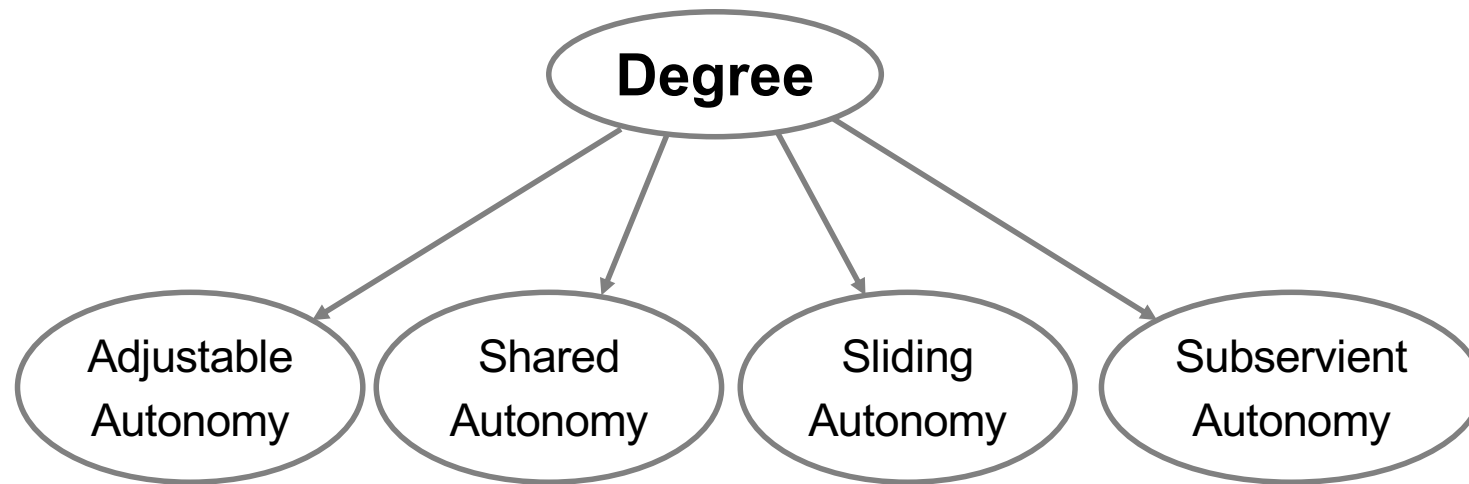




The system controls its own behaviour to a greater or lesser extent

BUT

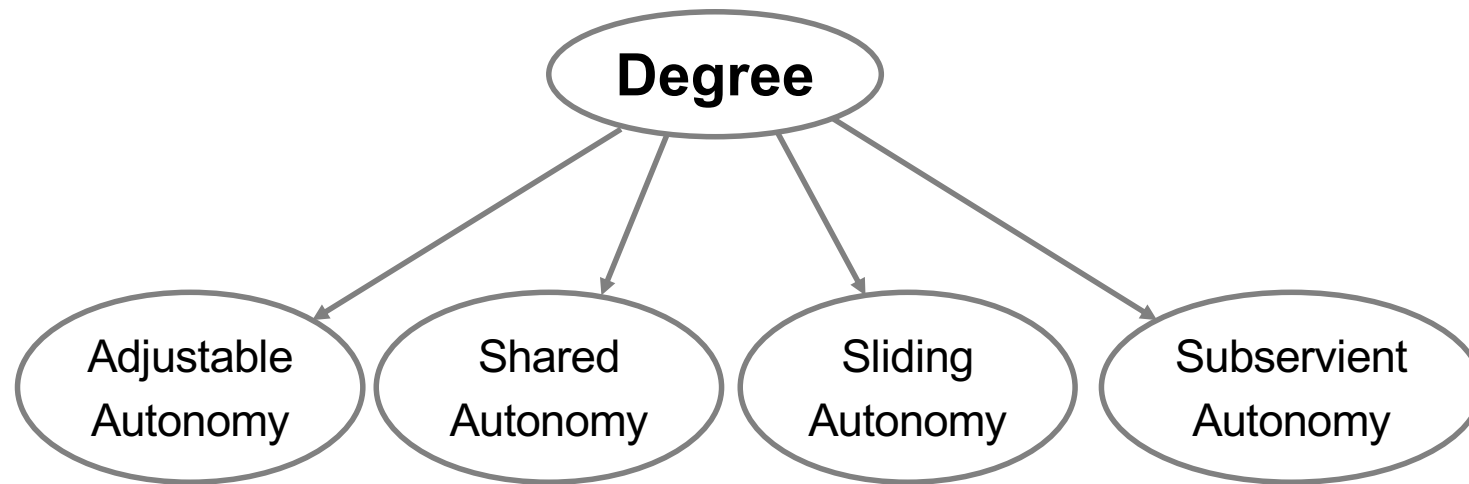
The goals are determined by the human with which it is interacting



Issues, especially working with team of robots

The human operator may not always be aware of everything that is happening

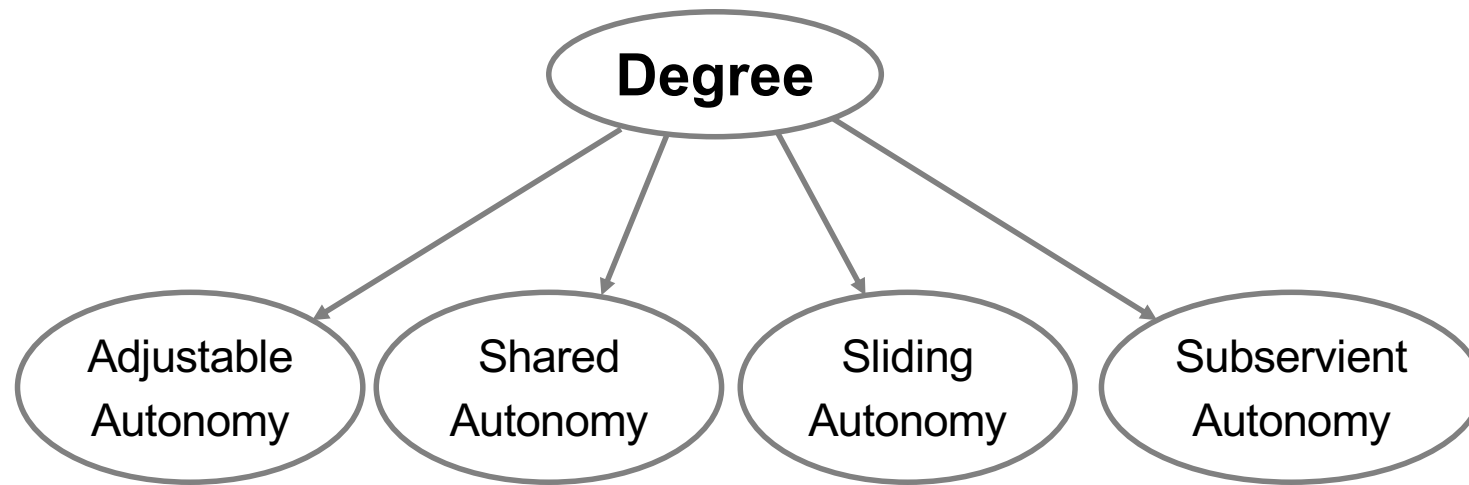
... the robot may have to ask for help



Issues, especially working with team of robots

The human will take time to assess the situation

... the robot needs to take account of this



Issues, especially working with team of robots

When the human does take control of a robot

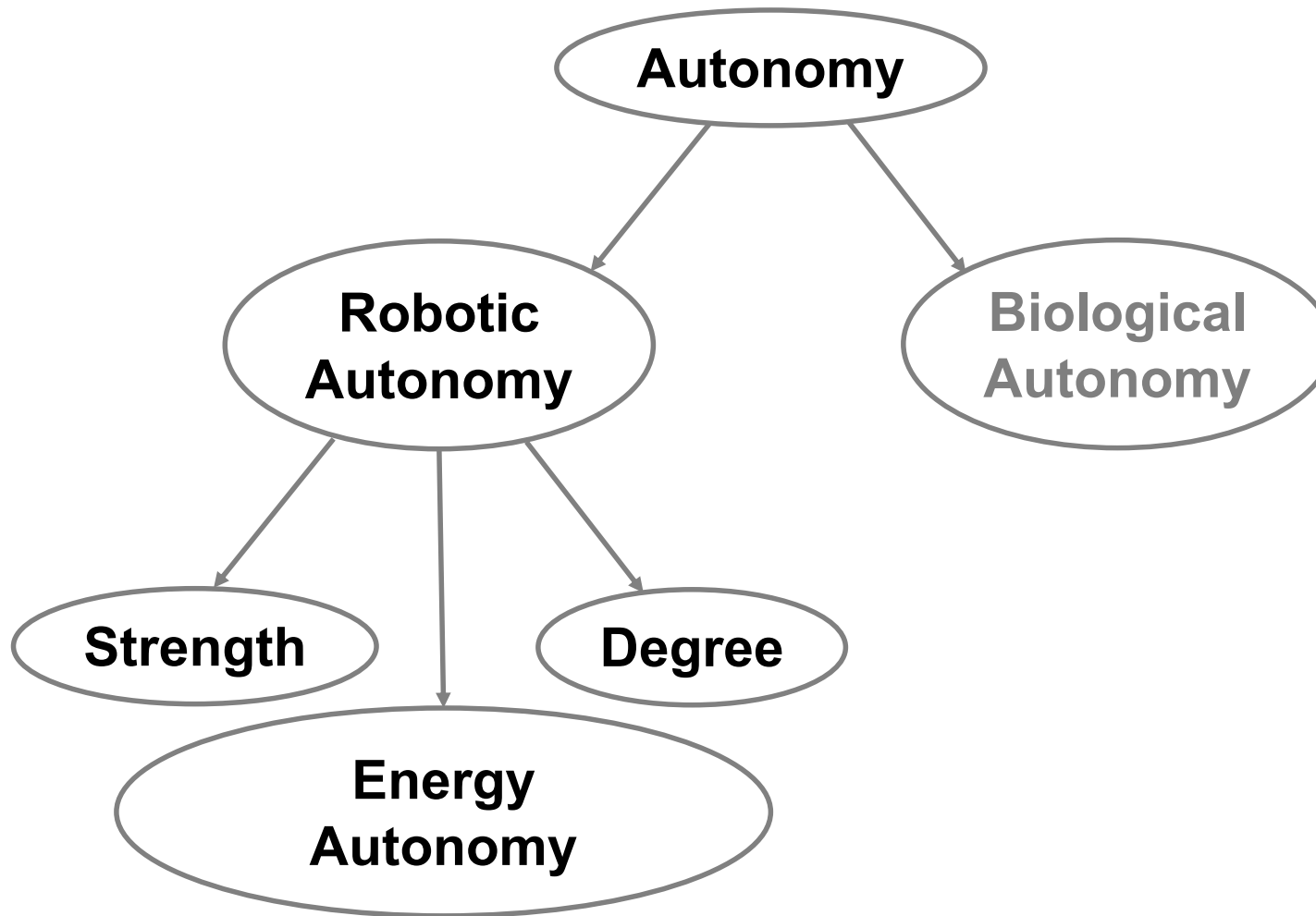
... the other robots in the team still have to work together effectively

## Characterization of shared responsibility

1. The human does the whole job up to the point of turning it over to the computer to implement
2. The computer helps by determining options
- ...
10. The computer does whole job if it decides it should be done, and if so tells human, if it decides he should be told

T. B. Sheridan and W. L. Verplank. Human and computer control for undersea teleoperators. Technical report, MIT Man-Machine Systems Laboratory, 1978.





The robot can operate for extended periods of time without being connected to an external power outlet

# Reading

Vernon, D. *Artificial Cognitive Systems – A Primer*, MIT Press, 2014; Chapter 4.