

# Introduction to COMP26120: Video 2

## What is an Algorithm?

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Definition of **algorithm** noun from the Oxford Advanced Learner's Dictionary

## algorithm *noun*

 /'ælgərɪðəm/

 /'ælgərɪðəm/

(*computing*)

★ a set of rules that must be followed when solving a particular problem

- *The company uses **machine-learning algorithms** to recommend jobs to those looking for work.*
- *to **apply** a complex/sophisticated **algorithm***
- *to **develop/design/tweak** an **algorithm***
- *From internet shopping to the airport runway, algorithms are everywhere in modern life.*

### — Word Origin

late 17th cent. (denoting the Arabic or decimal notation of numbers): variant (influenced by Greek *arithmos* 'number') of Middle English *algorism*, via Old French from medieval Latin *algorismus*. The Arabic source, *al-Ḳwārizmī* 'the man of Ḳwārizm' (now Khiva), was a name given to the 9th-cent. mathematician Abū Ja'far Muhammad ibn Mūsā, author of widely translated works on algebra and arithmetic.



# Computational Problem vs. Algorithm

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## Computational Problem

A desired relationship between input(s) and output(s)

Example: The Sorting Problem

*Input.* A list  $L$  of numbers

*Output.* A permutation of  $L$  that is in order

## Algorithm

A well-defined set of steps transforming input(s) into output(s) *solving a computational problem.*

Example: Insertion Sort, Bubble Sort etc.,



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My Lovely Algorithm



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Is it correct?

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Does it solve the given  
computational problem?

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Does it solve the given  
computational problem?

How fast is it?

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How much memory does  
it use?

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How does its performance  
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In the best case? Worst case?  
Average case?

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Is it deterministic?

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My Lovely Algorithm

Is it deterministic?

Will it always terminate?

Is it correct?

Does it solve the given  
computational problem?

How fast is it?

How much memory does  
it use?

How does its performance  
scale with the size of inputs?

In the best case? Worst case?  
Average case?

My Lovely Algorithm

Is it deterministic?

Will it always terminate?

How 'good' is the output?

How fast is it?

How much memory does it use?

Does it solve the given computational problem?

How does its performance scale with the size of inputs?

Is it correct?

In the best case? Worst case? Average case?

My Lovely Algorithm

Does it scale with available computational resources?

Is it deterministic?

Does it have good memory locality?

Will it always terminate?

Is it secure?

How 'good' is the output?