

2nd Year of Higher Cycle

2021 - 2022

---

# Exact and Approximate Algorithms for Combinatorial Optimisation, The Traveling Salesman Problem as An Application

---

*Made by :*

ALIOUSALAH Mohamed Nassim

BELGOUNMRI Mohammed Djameledine

MELIANI Abdelghani

AÏT MEZIANE Mohamed Amine

LOUCIF Taha Ammar

*Supervised by :*

Mme. BESSEDIK M

M. KECHID A

April 27, 2022

# Contents

<b>Cover page</b>	<b>1</b>
<b>Table of contents</b>	<b>1</b>
<b>1 Problem Statement</b>	<b>2</b>
1.1 . . . . .	2
<b>2 Branch and Bound</b>	<b>3</b>
2.1 Motivation . . . . .	3
2.2 The idea of Branch and Bound . . . . .	3
2.3 The implementation . . . . .	4

# Chapter 1

## Problem Statement

### 1.1

# Chapter 2

## Branch and Bound

### 2.1 Motivation

The direct method as we have seen is, despite the simplicity of its implementation, unrealistically slow for even very small instances.

Faster exact algorithms exist, but none of them is polynomial since TSP is NP-complete. In fact, under the assumption  $P \neq NP$ , no polynomial solution exists.

Branch and Bound is one such algorithm that we will dedicate the rest of the chapter to.

### 2.2 The idea of Branch and Bound

The idea of Branch and Bound is to eliminate certain branches from the search space to decrease runtime.

This is done by computing a *lower bound* and *upper bound* for every branch, and then pruning branches that are guaranteed to be worse than the best known solution.

## 2.3 The implementation