



# 113 學年度 元智大學 工業工程與管理學系 畢業專題 職業籃球 P-LEAGUE+ 賽事排程最佳化問題

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## 研究動機與目的

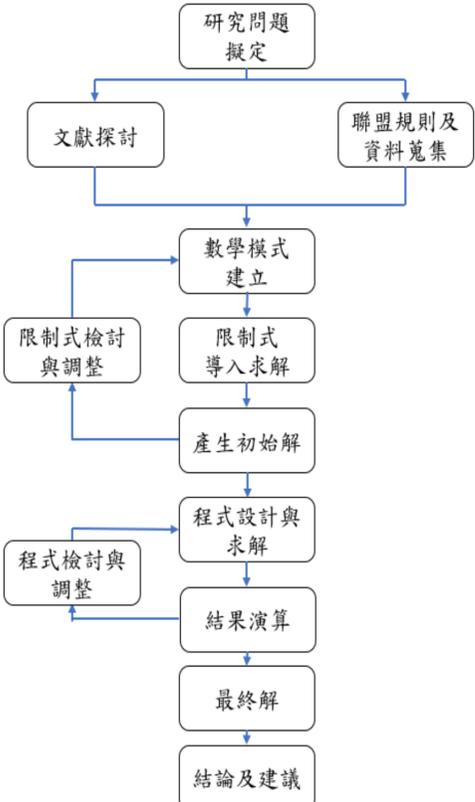
運動產業正處於蓬勃發展階段，各種運動聯賽如 P-LEAGUE+ 聯盟也因其受眾廣泛而日益受到關注。在這樣的背景下，聯盟賽程排程管理成了一個不容忽視的議題。適當的賽程安排不僅關係到比賽的公平性和觀眾體驗，更直接影響到運動員的身體狀態和競技表現，以競賽來說，講求的當然是一個公平。不具公平性的賽事排程，通常會受到觀眾斥責或球隊的抗議。

## 個案背景介紹



P-LEAGUE+ (簡稱 PLG) 是台灣職業籃球聯賽，成立於 2020 年，致力於提升台灣籃球競技水平與產業化發展。聯盟目前包含多支城市代表隊，以主客場制進行比賽，強調公平競爭與精彩表現。P-LEAGUE+ 吸引了忠實球迷，並成功結合行銷與娛樂，讓比賽成為家庭共享的休閒活動。聯盟的快速成長帶動相關產業發展，成為台灣體育文

## 研究流程



## 研究方法

研究環境



Google OR-Tool

Constraint Programming

寬放  
↓  
嚴謹

限制條件及數學模型建立

目標式: 最小化每支球隊旅行距離之 MAD

$$\text{Minimize } \sum_{i=1}^T |total\_distance[i] - mean\_distance| / 4$$

其中, T=4(隊伍數量)

限制式

- H1: 例行賽應賽 48 場(每支球隊要打 24 場)
- H2: 每支球隊主場+客場為 24
- H3: 一周內有連續打主場, 一周內同一支隊伍不能連續客場
- H4: 一週比賽 2 場(總共約 24 週)
- H5: 每支球隊要跟其他球隊各打 8 場

項目	主客場數量			每週出賽頻率	
	不限制	容許寬放	需相等	不限制	每週每隊皆須出賽
Case1	✓			✓	
Case2		✓		✓	
Case3		✓			✓
Case4			✓	✓	
Case5			✓		✓

## 研究結果

Case1

沒有要求主客場相同

對戰組合 (Home vs Away)	次數
('Team1', 'Team2')	4
('Team1', 'Team3')	7
('Team1', 'Team4')	1
('Team2', 'Team1')	4
('Team2', 'Team4')	8
('Team3', 'Team1')	1
('Team3', 'Team2')	8
('Team3', 'Team4')	3
('Team4', 'Team1')	7
('Team4', 'Team3')	5
Total	48

Total Travel Distances:  
 Team1: 2701 km  
 Team2: 2756 km  
 Team3: 2729 km  
 Team4: 2718 km  
 Mean Absolute Deviation (MAD): 16.5 km

Case2

主客場要求寬放

```

    Week 1:
    Team4 (Home) vs Team2 (Away)
    Team4 (Home) vs Team3 (Away)
    Week 2:
    Team4 (Home) vs Team2 (Away)
    Team4 (Home) vs Team3 (Away)
    Week 3:
    Team4 (Home) vs Team2 (Away)
    Team4 (Home) vs Team3 (Away)
    Week 4:
    Team4 (Home) vs Team1 (Away)
    Team4 (Home) vs Team2 (Away)
    Week 5:
    Team3 (Home) vs Team4 (Away)
    Team4 (Home) vs Team2 (Away)
  
```

Total Travel Distances:  
 Team1: 2824 km  
 Team2: 2633 km  
 Team3: 2816 km  
 Team4: 2631 km  
 Mean Absolute Deviation (MAD): 94.0 km

新增限制式:

每週每支球隊皆要出賽

Case3

```

    Week 1:
    Team2 (Home) vs Team4 (Away)
    Team3 (Home) vs Team1 (Away)
    Week 2:
    Team2 (Home) vs Team1 (Away)
    Team4 (Home) vs Team3 (Away)
    Week 3:
    Team2 (Home) vs Team4 (Away)
    Team3 (Home) vs Team1 (Away)
    Week 4:
    Team1 (Home) vs Team3 (Away)
    Team4 (Home) vs Team2 (Away)
    Week 5:
    Team3 (Home) vs Team1 (Away)
    Team4 (Home) vs Team2 (Away)
    Week 6:
    Team1 (Home) vs Team3 (Away)
    Team4 (Home) vs Team2 (Away)
  
```

Total Travel Distances:  
 Team1: 2824 km  
 Team2: 2633 km  
 Team3: 2816 km  
 Team4: 2631 km  
 Mean Absolute Deviation (MAD): 94.0 km

要求主客場嚴格相同(主客各四)

& 每週每支球隊皆須出賽

Case4

```

    Week 1:
    Team2 (Home) vs Team3 (Away)
    Team3 (Home) vs Team2 (Away)
    Week 2:
    Team1 (Home) vs Team3 (Away)
    Team4 (Home) vs Team2 (Away)
    Week 3:
    Team2 (Home) vs Team1 (Away)
    Team4 (Home) vs Team3 (Away)
    Week 4:
    Team1 (Home) vs Team3 (Away)
    Team4 (Home) vs Team2 (Away)
    Week 5:
    Team1 (Home) vs Team2 (Away)
    Team1 (Home) vs Team4 (Away)
  
```

Total Travel Distances:  
 Team1: 2824 km  
 Team2: 2592 km  
 Team3: 2580 km  
 Team4: 2908 km  
 Mean Absolute Deviation (MAD): 140.0 km

Case5

```

    Week 1:
    Team2 (Home) vs Team4 (Away)
    Team3 (Home) vs Team1 (Away)
    Week 2:
    Team1 (Home) vs Team4 (Away)
    Team3 (Home) vs Team2 (Away)
    Week 3:
    Team2 (Home) vs Team1 (Away)
    Team3 (Home) vs Team4 (Away)
    Week 4:
    Team1 (Home) vs Team2 (Away)
    Team4 (Home) vs Team3 (Away)
    Week 5:
    Team1 (Home) vs Team4 (Away)
    Team3 (Home) vs Team2 (Away)
  
```

Total Travel Distances:  
 Team1: 2824 km  
 Team2: 2592 km  
 Team3: 2580 km  
 Team4: 2908 km  
 Mean Absolute Deviation (MAD): 140.0 km

相較於 Case 2、3 MAD 上升

項目	MAD	評價結果		
		符合限制條件	經濟效益(以球隊對戰分散情況)	每個對戰公平性(以主客分布)
Case1	16.5	Yes	差	不公平
Case2	94	Yes	極差	中等
Case3	94	Yes	優	中等
Case4	140	Yes	中等	公平
Case5	140	Yes	優	公平

## 結論

結論

- 主客場分配均勻可有效降低旅行距離差異
- 放寬限制會增加旅行距離不均，影響公平性。

未來發展可能

- 加入觀眾與收視率因素，提升賽程價值。
- 探索動態調整應對賽季突發狀況。