

Metaheuristics Project

Gregor Foitzik, Kevin Towa, Jonas Ginster

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1 Large Neighborhood Search

Algorithm 1 Pseudocode for the Large-Neighborhood Search

```
1: function LNS( $s^*$ ,  $t$ , config)
2:    $s_{\text{best}} \leftarrow s^*$ 
3:    $n \leftarrow 0$  ▷ Numer of iterations with no change
4:   while  $n \leq 100 \wedge t_{\text{run}} < t$  do ▷ Do not exceed time limit
5:      $s_{\text{destroyed}} \leftarrow \text{DESTROY}(s^*)$ 
6:      $s_{\text{repair}} \leftarrow \text{REPAIR}(s_{\text{destroyed}})$ 
7:     if  $s_{\text{repair}} > s_{\text{best}}$  then
8:        $s_{\text{best}} \leftarrow s_{\text{repair}}$ 
9:        $n \leftarrow 0$ 
10:    else
11:       $n \leftarrow n + 1$  ▷ If the solution is not better, increase  $n$ 
12:    end if
13:  end while
14: end function
```

Algorithm 2 Pseudocode for the Destroy Operators

```
1: function DESTROY( $s^*$ )
2:    $o \leftarrow$  randomly choose destroy operator
3:   if  $o = 1$  then
4:     weeks, games  $\leftarrow$  Randomly destroy 2 or 3 weeks ▷ Use uniform distribution
5:   else if  $o = 2$  then
6:     weeks, games  $\leftarrow$  Destroy the 2 or 3 worst weeks
7:   end if return weeks, games
8: end function
```

Algorithm 3 Pseudocode for the Repair Operators

```
1: function REPAIR( $s^*, n, \text{weeks}, \text{games}, t$ )
2:   if  $n > 6 \wedge |\text{weeks}| > 2$  then
3:      $o \leftarrow$  randomly choose repair operator  $\setminus \{1\}$   $\triangleright$  Use uniform distribution
4:   else
5:      $o \leftarrow$  randomly choose repair operator  $\triangleright$  Use uniform distribution
6:   end if
7:   if  $t > 25$  then
8:      $o \leftarrow$  randomly choose repair operator  $\setminus \{1, 2\}$   $\triangleright$  Use uniform distribution
9:   end if
10:  if  $o = 1$  then
11:    for  $\text{week} \in \text{weeks}$  do
12:       $\text{week}_{\text{new}} \leftarrow \text{RANDOMINSERTION}(s^*, \text{games}, \text{week}, n, t)$ 
13:    end for
14:     $\text{weeks}, \text{games} \leftarrow$  Destroy the 2 or 3 worst weeks
15:  else if  $o = 2$  then
16:    for  $\text{week} \in \text{weeks}$  do
17:       $\text{week}_{\text{new}} \leftarrow \text{INSERTGAMEMAXPROFITWEEK}(s^*, \text{games}, \text{week}, n, t)$ 
18:    end for
19:     $\text{weeks}, \text{games} \leftarrow$  Destroy the 2 or 3 worst weeks
20:  end if return  $\text{weeks}, \text{games}$ 
21: end function
```

Algorithm 4 Pseudocode for random-insertion

```
1: function RANDOMINSERTION( $s^*, \text{games}, \text{week}, n, t$ )
2:    $n_{\text{mon}} \leftarrow \max(1, \frac{n}{2} - 2 \cdot \lceil \frac{n}{2} \cdot t \rceil)$ 
3:    $n_{\text{fri, sat}} \leftarrow \lceil \frac{n}{2} \cdot t \rceil$ 
4:    $\text{team}_{\text{mon}} \leftarrow$  Get teams to play on monday
5:    $\text{games}_{\text{added}} \leftarrow \emptyset$ 
6:   if  $\text{team}_{\text{mon}} \neq \emptyset$  then
7:      $\text{games}_{\text{mon}} \leftarrow$  Get games on monday based on  $\text{team}_{\text{mon}}$ 
8:      $n_{\text{mon}} \leftarrow \max(n_{\text{mon}}, |\text{games}_{\text{mon}}|)$ 
9:      $s^* \leftarrow s^* \cup \text{games}_{\text{mon}}[: n_{\text{mon}}]$ 
10:     $\text{games}_{\text{added}} \leftarrow \text{games}_{\text{added}} \cup \text{games}_{\text{mon}}[: n_{\text{mon}}]$ 
11:   end if
12: end function
```

Algorithm 5 Pseudocode for inserting the game with max-profit

```
1: function INSERTGAMEMAXPROFITWEEK( $s^*$ ,  $games$ ,  $week$ ,  $n$ ,  $t$ )
2:   if  $n > 6 \wedge |\text{weeks}| > 2$  then
3:      $o \leftarrow$  randomly choose repair operator  $\setminus \{1\}$             $\triangleright$  Use uniform distribution
4:   else
5:      $o \leftarrow$  randomly choose repair operator            $\triangleright$  Use uniform distribution
6:   end if
7:   if  $t > 25$  then
8:      $o \leftarrow$  randomly choose repair operator  $\setminus \{1, 2\}$         $\triangleright$  Use uniform distribution
9:   end if
10:  if  $o = 1$  then
11:    weeks, games  $\leftarrow$  Randomly destroy 2 or 3 weeks
12:  else if  $o = 2$  then
13:    weeks, games  $\leftarrow$  Destroy the 2 or 3 worst weeks
14:  end if return weeks, games
15: end function
```
