

Combined_Scores

February 10, 2023

```
[1]: import pandas as pd
import cobra
```

```
[2]: model = cobra.io.load_json_model('iJN1463_IPP_bypass.json')
```

1 Load EMA-based and Opt-based targets

```
[3]: EMA_score = pd.read_csv('EMA-based_targets.csv', index_col=0)
EMA_score.sort_values('EMA-based_Score', ascending=False).head()
```

```
[3]:
```

| | cMCS | EFM tool | EMA-based_Score |
|---------|----------|----------|-----------------|
| GLCDpp | 0.671667 | 0.0 | 0.636194 |
| PDH | 0.616111 | 0.0 | 0.583573 |
| LDH_D | 0.500000 | 1.0 | 0.526406 |
| ACACT1r | 0.497778 | 0.0 | 0.497778 |
| PPS | 0.450000 | 1.0 | 0.479047 |

```
[4]: Opt_score = pd.read_csv('Opt-based_targets.csv', index_col=0)
Opt_score.sort_values('Opt-based_Score', ascending=False).head()
```

```
[4]:
```

| | OptKnock | OptKnock_blocked_exchanges | Opt-based_Score |
|---------|----------|----------------------------|-----------------|
| ACt2rpp | 0.958333 | | 0.922132 |
| CS | 0.758333 | | 0.833539 |
| HMGL | 0.958333 | | 0.697798 |
| BDH | 0.966667 | | 0.681052 |
| TPI | 0.950000 | | 0.676521 |

```
[5]: Combined = EMA_score[['EMA-based_Score']].join(Opt_score['Opt-based_Score'],
↳how='outer')
Combined.head()
```

```
[5]:
```

| | EMA-based_Score | Opt-based_Score |
|-------------|-----------------|-----------------|
| 1PPDCRc | 0.011111 | 0.001901 |
| 3HAACOAT100 | 0.055556 | NaN |
| 3HAACOAT120 | 0.055556 | NaN |
| 3HAACOAT121 | 0.055556 | 0.004167 |
| 3HAACOAT140 | NaN | 0.007969 |

2 Filter essential reactions, transport reactions, and reactions without genes

```
[6]: gene_essentiality = pd.read_table('Gene_Essentiality.txt', index_col=0)
gene_essentiality.head()
```

```
[6]:
```

| | Proteins | RbTnSeq Data |
|----------|----------|---------------|
| Genes | | |
| PP_s0001 | PP_s0001 | spontaneous |
| PP_3591 | dpkA | Non Essential |
| PP_1257 | PP_1257 | Non Essential |
| PP_2136 | fadB | Non Essential |
| PP_2008 | fadH | Non Essential |

```
[7]: essential_reactions = [x for x in Combined.index if ((x in model.reactions) and
any(gene_essentiality.loc[g.id, 'RbTnSeq Data'] ==
↳ 'Essential' for g in
model.reactions.get_by_id(x).genes if g.id in
↳ gene_essentiality.index))]
Combined.drop(essential_reactions, inplace=True)
```

```
[8]: transporters = [x for x in Combined.index if ((x in model.reactions) and
(all(c in model.reactions.get_by_id(x).compartments for c in
↳ ['c', 'p']) or
all(c in model.reactions.get_by_id(x).compartments for c in
↳ ['e', 'p'])))]
Combined.drop(transporters, inplace=True)
```

```
[9]: reactions_without_genes = [x for x in Combined.index if ((x in model.reactions)
↳ and
not model.reactions.get_by_id(x).genes)]
Combined.drop(reactions_without_genes, inplace=True)
```

3 Rank targets for each method and choose top priority targets

```
[10]: Combined_rank = Combined.rank(ascending=False)
Combined_rank['Combined_rank'] = Combined_rank.mean(axis=1, skipna=False).rank()
Combined_rank.sort_values(by='Combined_rank', inplace=True)
```

Top 10 targets by both EMA-based and Opt-based methods

```
[11]: Combined_rank_top10 = Combined_rank[(Combined_rank['EMA-based_Score'] <= 10) &
↳ (Combined_rank['Opt-based_Score'] <= 10)]
Combined_rank_top10
```

```
[11]:
```

| | EMA-based_Score | Opt-based_Score | Combined_rank |
|------|-----------------|-----------------|---------------|
| HMGL | 9.0 | 2.0 | 1.5 |
| GND | 5.0 | 6.0 | 1.5 |
| BDH | 9.0 | 3.0 | 3.0 |

Top targets by EMA-based method, but not top 10 by Opt-based method

```
[12]: Combined_rank.sort_values(by='EMA-based_Score').drop(Combined_rank_top10.  
    ↪index)[0:5]
```

```
[12]:
```

| | EMA-based_Score | Opt-based_Score | Combined_rank |
|---------|-----------------|-----------------|---------------|
| LDH_D | 1.0 | NaN | NaN |
| ACACT1r | 2.0 | 21.0 | 6.0 |
| PPS | 3.0 | 91.0 | 28.0 |
| KAT1 | 4.0 | 26.0 | 10.0 |
| PC | 6.0 | 44.0 | 16.0 |

Top targets by Opt-based method, but not top 10 by EMA-based method

```
[13]: Combined_rank.sort_values(by='Opt-based_Score').drop(Combined_rank_top10.  
    ↪index)[0:5]
```

```
[13]:
```

| | EMA-based_Score | Opt-based_Score | Combined_rank |
|-------|-----------------|-----------------|---------------|
| CS | 19.0 | 1.0 | 5.0 |
| TPI | 21.0 | 4.0 | 7.5 |
| PGK | 12.0 | 5.0 | 4.0 |
| GARFT | 34.0 | 7.0 | 15.0 |
| ICL | 57.0 | 8.0 | 18.0 |