Branch & Bound

I Identifies the solution to an integer problem through relaxation of integer constraints

I For a non-integer optimal variable found in the relaxed problem, denoted ˜x, the problem is then split into two sub-problems constrained around ˜x, by x ≥ ˜x or x ≤ ˜x.

From www.gurobi.com/resources/getting-started/mip-basics

APPM 4720/5720 (special topics)
"Advanced Convex Optimization"
Prof. Becker, fall 2018

Student projects

Sparse Optimization (background subtraction)
(Will Shand)

Optimizing Honey Bee Foraging Yield through Efficient Waggle Dancing
(Richard Clancy, Liam Madden, Daniel Ferguson)

For our project, we investigated optimal parameter values to maximize the foraging yield of honey bees given two food sources. We solved the optimization problem via grid search, Nelder-Mead, a direct method, and the Adjoint State Method.

Robust stationkeeping control on unstable orbits
Concept: find optimal feedback policy w/ safety constraints & minimum expected fuel cost

→ two convex problems w/ a dynamical approximation

Originally non-convex problem

→ two convex problems w/ a dynamical approximation

NBA DraftKings optimal lineup selection
(Cheryl Hansen, Nelson Mitchell, Tyler Schuessler)

Greedy Algorithm

<table>
<thead>
<tr>
<th>Sample Lineups</th>
<th>Greedy Algorithm</th>
<th>Avg. Optimal f(x)</th>
<th>Avg. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthony Davis</td>
<td>Cody Zeller</td>
<td>Cameron Payne</td>
<td>Andre Roberson</td>
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<tr>
<td>Cameron Payne</td>
<td>Cody Zeller</td>
<td>DeMarcus Cousins</td>
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<td>Danilo Gallinari</td>
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<td>Dorian Finney-Smith</td>
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<td>Harrison Barnes</td>
<td>Isaiah Thomas</td>
<td>John Wall</td>
<td>Michael Carter-Williams</td>
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<td>Tyson Chandler</td>
<td>Zach LaVine</td>
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<td>Klay Thompson</td>
<td>Camilo Payne</td>
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<td>Mike Muscala</td>
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</tbody>
</table>

Set Covering in Boulder (for mothership/drone problem)
(Hasti Rahemi and Sam Zhang)

Support Vector Clustering
(Grant Baker, Matt Maierhofer)

- Use support vector machine infrastructure to find hypersphere to enclose all data in feature space
- If line between points is entirely within hypersphere, points are in the same cluster
- Naive algorithm slow, but possible speedup with stochastic gradient and reduction of number of points to check
- Performs well only with fine hyperparameter tuning

Student backgrounds:
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- Engineering Physics (BS)
- Computer Science (BS)
- Business (PhD)
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