Baking

UDLS #216 or so
November 9, 2012 -- Mark Spear

Help yourself to cookies & pomegranate arils now, but not the cake (yet)

If I had done this as originally scheduled (3 weeks ago: oct. 19)

Title: Baking

Abstract: UDLS on baking. There will be brownies.

Location: Vancouver

Old punchline: Not what you're thinking. We're basically as far away from 4/20 as possible (just shy of 1/2 year)

New punchline: Maybe if the location was Washington

...but since it was delayed

Pomegranates!

Motivation

Previous work:

- brewing coffee
- brewing beer

I'm the tea czar, but not a master of "brewing tea", so I will have to focus on the other important component of Tuesday Tea:

Treats / Baked goods

Education analogy

This presentation will (try to) cover (a small subset of) a well-rounded education in terms of baking.

It's a cheap gimmick, but so is influencing the audience with baked goods.

And I'm not above that.

First lesson (i.e. let me preemptively deflect complaints about the cake)

If you follow the recipe, it'll be pretty good, even if you screw some things up (within reason)

e.g. Failures with the cake:
- "CS" template
- size, alignment of layers
- rainbowness
- hopefully not taste?

Primary / Kindergarten lesson (cake time)

Sharing is: {caring, good, fun, important, ...}

Sharing is... game theory?

1. Make a single cut in the cake
2. Hover knife over cake, gradually increasing angle of next cut
3. Anyone who hasn't received a slice of cake yet calls stop. They get that slice.
4. If there's cake left and people without cake, go back to 2

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Cooking for Geeks

Real Science, Great Hacks, and Good Food

O'REILLY®

Jeff Potter

Optimal Envy-Free Cake Cutting

Yuga J. Cohler
Harvard SEAS
ycohler@fas.harvard.edu

John K. Lai
Harvard SEAS
jklai@post.harvard.edu

David C. Parkes
Harvard SEAS
parkes@eecs.harvard.edu

Ariel D. Procaccia
Harvard SEAS
arielpro@seas.harvard.edu

Abstract

We consider the problem of fairly dividing a heterogeneous divisible good among agents with different preferences. Previous work has shown that envy-free allocations, i.e., where each agent prefers its own allocation to any other, may not be efficient, in the sense of maximizing the total value of the agents. Our goal is to pinpoint the most efficient allocations among all envy-free allocations. We provide tractable algorithms for doing so under different assumptions regarding the preferences of the agents.

1. Introduction

We study the problem of dividing an infinitely divisible resource among several agents, often interpreted intuitively as cutting a cake. Agents have valuation functions that assign a value to each piece of cake; in general agents have different valuation functions. This problem has attracted significant attention in AI (see, e.g., Chen et al. (2010) and the references therein).

The reason for this interest is twofold. First, resource al-

Most of the literature on cake cutting investigates algorithms that instruct agents to perform certain operations. In contrast, we examine an alternate algorithmic model where agents report their entire valuations to the algorithm (see, e.g., Chen et al. (2010); Zivan et al. (2010)). While this approach is infeasible for general valuation functions, it is tractable for the special cases discussed in this paper. Our goal is therefore:

> *Given the valuation functions, tractably compute an optimal EF allocation.*

In some cases we relax this goal, asking only for approximate efficiency, approximate envy-freeness, or both.

Our results. Our presentation of the results progresses through three levels of generality in terms of the supported valuation functions. In Section 3 we assume that the valuation functions are piecewise constant, i.e., can be represented by a step function. We give a polynomial-time algorithm that computes optimal EF allocations via a simple linear programming approach.

Math lesson

Not too much math required

- Multiplying recipe (hopefully easy for grad-level CS students)
- Metric conversions
  - The above 2 aren't even necessary if using certain recipe websites
- Volume/shape/baking time
  - Remember to account for change in thickness by adjusting baking time

Science lesson

"Most baked goods rely on air for their texture, flavour, and appearance"

- Generating air:
  - chemistry (baking powder and baking soda: bicarbonate+acid -> CO_2)
  - biology (yeast: fermentation)
  - mechanical (egg whites, egg yolks, sugar, whipped cream, steam: trap air)

Check out Cooking for Geeks if you care about the science

Economics lesson

So far it has basically been "follow the recipe"..

You can switch up the recipe to use things you have / not need to go out and buy stuff

successful strategy for tuesday tea veterans

use up the kitchen pantry: nuts, chocolate, fruits, berries, spices, ...

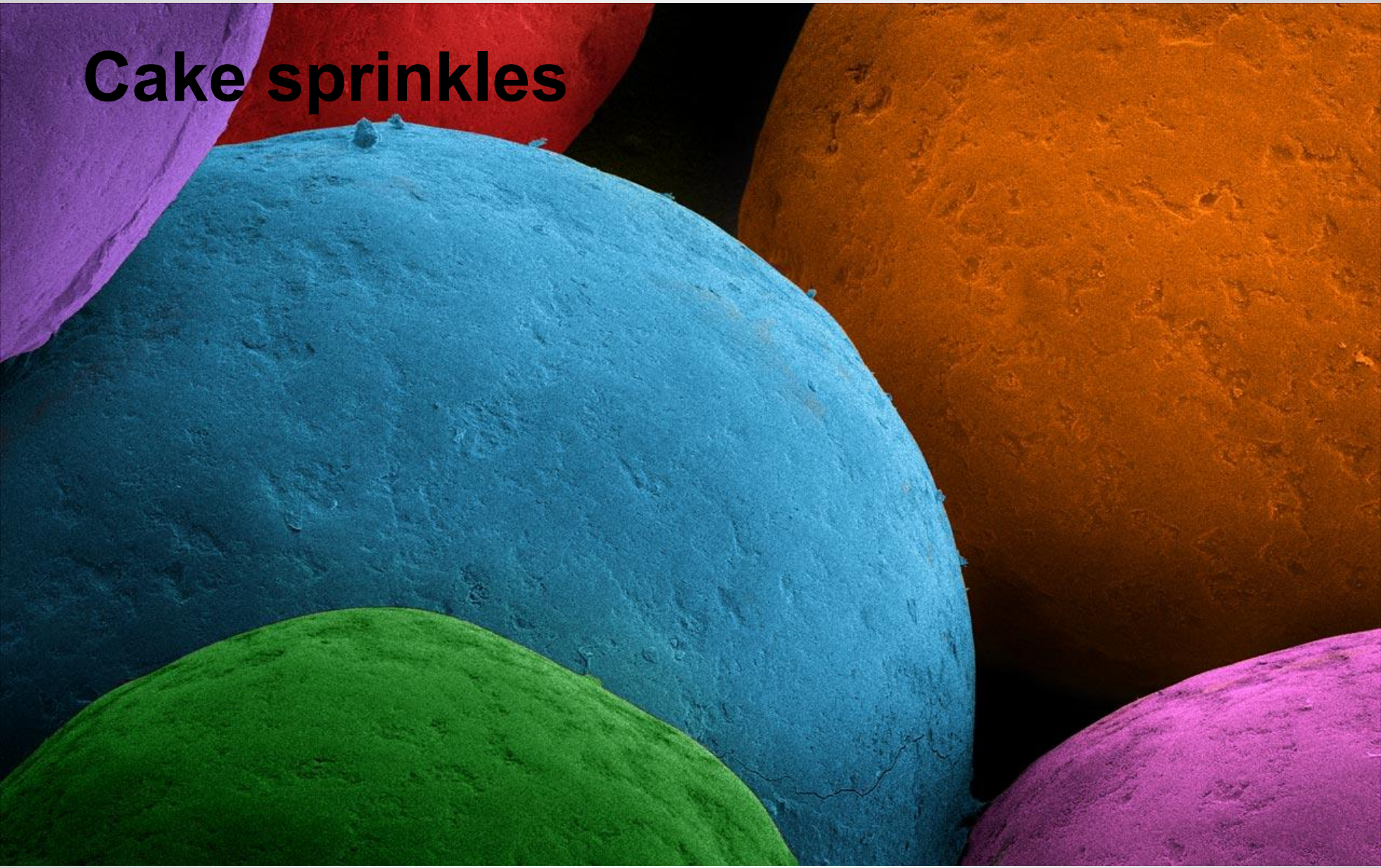
e.g. Pomegranate + white chocolate + oatmeal

Art lesson

- melted chocolate / tempering
  - (Bonus science lesson: Heat to 45°C (melts all crystal types), cool to 27°C (IV+V), seed, 31°C)
  - Chocolate problems: Seizing, blooming, ...
  - Too much for me
- food colouring
- sprinkles
- icing
  - The cake may demonstrate that these three are also too much for me to bother with

Crystal	Melting temp.	Notes
I	17 °C (63 °F)	Soft, crumbly, melts too easily
II	21 °C (70 °F)	Soft, crumbly, melts too easily
III	26 °C (79 °F)	Firm, poor snap, melts too easily
IV	28 °C (82 °F)	Firm, good snap, melts too easily
V	**34 °C (93 °F)**	**Glossy, firm, best snap, melts near body temperature (37 °C)**
VI	36 °C (97 °F)	Hard, takes weeks to form

Cake sprinkles



More art: Rainbow cake

Two approaches: separate or combined layers.

I'm not sure if I will regret choosing the one I did until a few slides ago

[Language lesson: complex future/past tenses are hard]

Even more art: Fondant

After class: Alcohol

My Drunk Kitchen Holiday:
America Day Pie Cakes

http://www.youtube.com/watch?v=cKf0GirR0-A

More alcohol (always more alcohol)

USDA alcohol burn-off chart

(artificial) vanilla extract ingredients:

water, alcohol, caramel colour, artificial flavour

http://youtube.com/watch?v=xwvoXzW-ocQ

Alcohol Burn-off Chart

Preparation Method	Percent Retained
alcohol added to boiling liquid & removed from heat	85%
alcohol flamed	75%
no heat, stored overnight	70%
baked, 25 minutes, alcohol not stirred into mixture	45%
Baked/simmered dishes with alcohol stirred into mixture:	
15 minutes cooking time	40%
30 minutes cooking time	35%
1 hour cooking time	25%
1.5 hours cooking time	20%
2 hours cooking time	10%
2.5 hours cooking time	5%

Grad school lesson

Weekly CSGSA events:

- UDLS (you are here)
- Beer*
- Tuesday Tea

The End

Thanks!