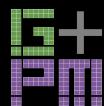


How Can I Cook With This?

The Challenges of AI in the Home Kitchen



Augmented Design Laboratory // Center for Games and Playable Media
<http://games.soe.ucsc.edu/adl> // <http://games.soe.ucsc.edu>



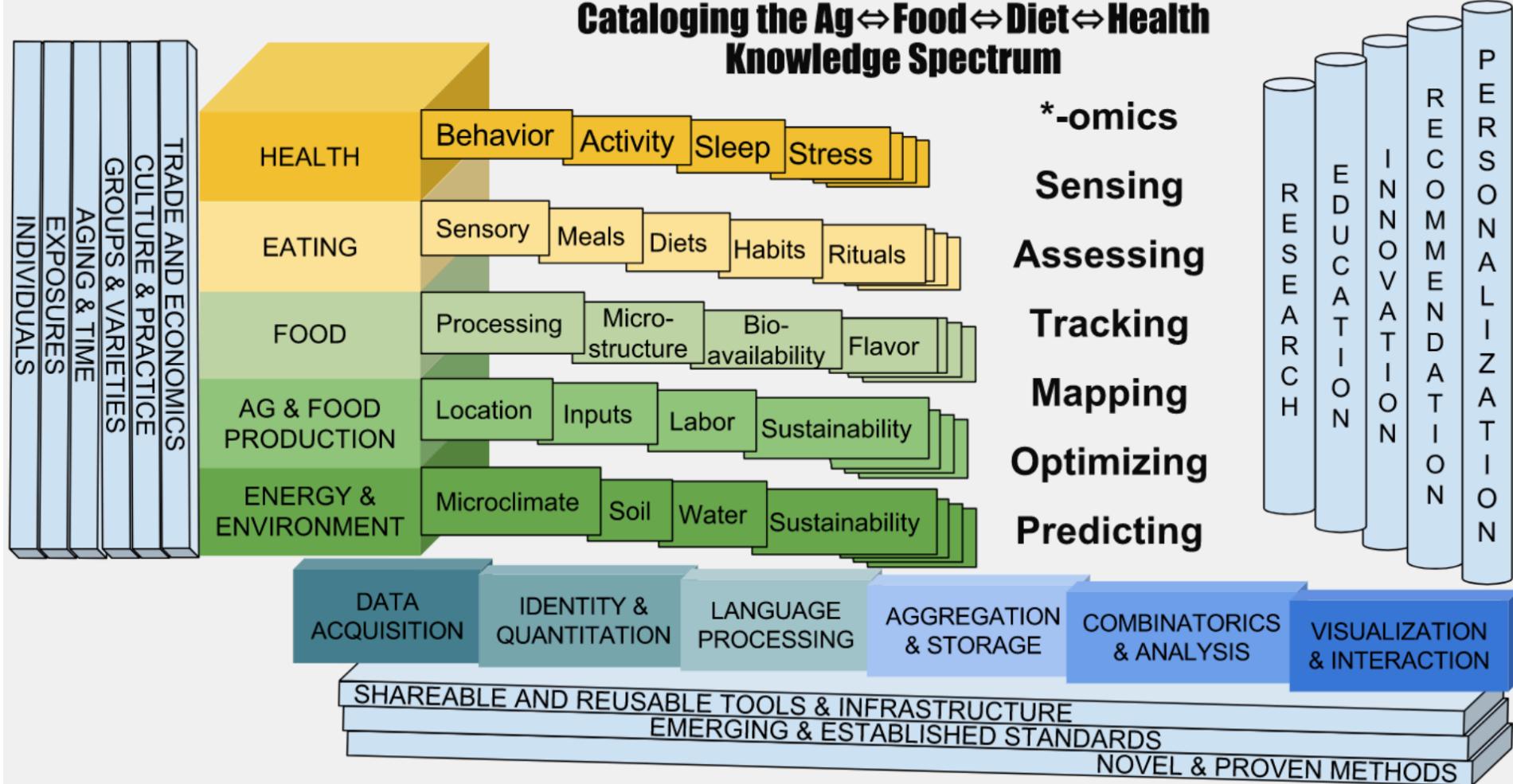
Johnathan Pagnutti

PhD Candidate

Introduction

Nov. 6-8, 2017

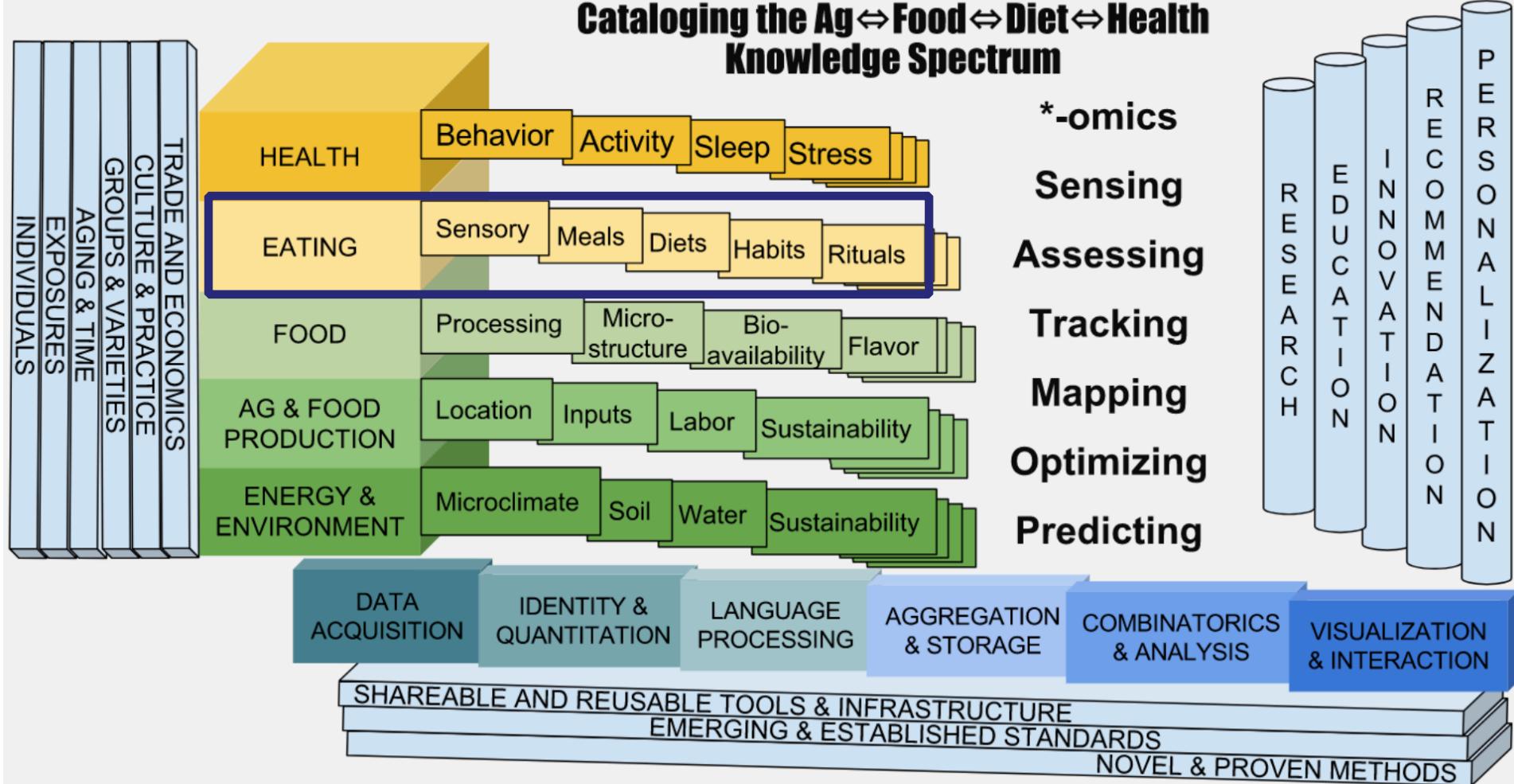
International Conference on Food Ontology Operability Data and Semantics Cataloging the Ag↔Food↔Diet↔Health Knowledge Spectrum



Introduction

Nov. 6-8, 2017

International Conference on Food Ontology Operability Data and Semantics Cataloging the Ag↔Food↔Diet↔Health Knowledge Spectrum



- » Primarily performed the work for this presentation as an intern at a startup (Wellio)
- » Dissertation focus is on kitchen AI, but not on UI/UX
 - » (I focus on flavor modeling and recipe generation)

A photograph of a person from the side, wearing a grey t-shirt, stirring vegetables in a black frying pan with a wooden spoon. The kitchen counter behind them is made of dark wood and holds various items: a grater, some eggs in a bowl, a glass of orange juice, a lemon, and some small jars. In the background, there's a brick wall and a window with a view of greenery.

About wellio

Our passion to build an intelligent assistant for meal planning comes from the challenges we see in our own families, which we know are shared by many others.

Our mission is to decode how meals are prepared and enjoyed at home

Home cooked meals are good for us, but too often life is busy. We fall back into making the same three or four recipes or getting unhealthy takeout.

Wellio is dedicated to making it more convenient for people to eat better – which means personalizing variety, healthiness, cost and more.

About wellio



Our passion to build an intelligent assistant for meal planning comes from the challenges we see in our own families, which we know are shared by many others.

Our mission is to decode how meals are prepared and enjoyed at home

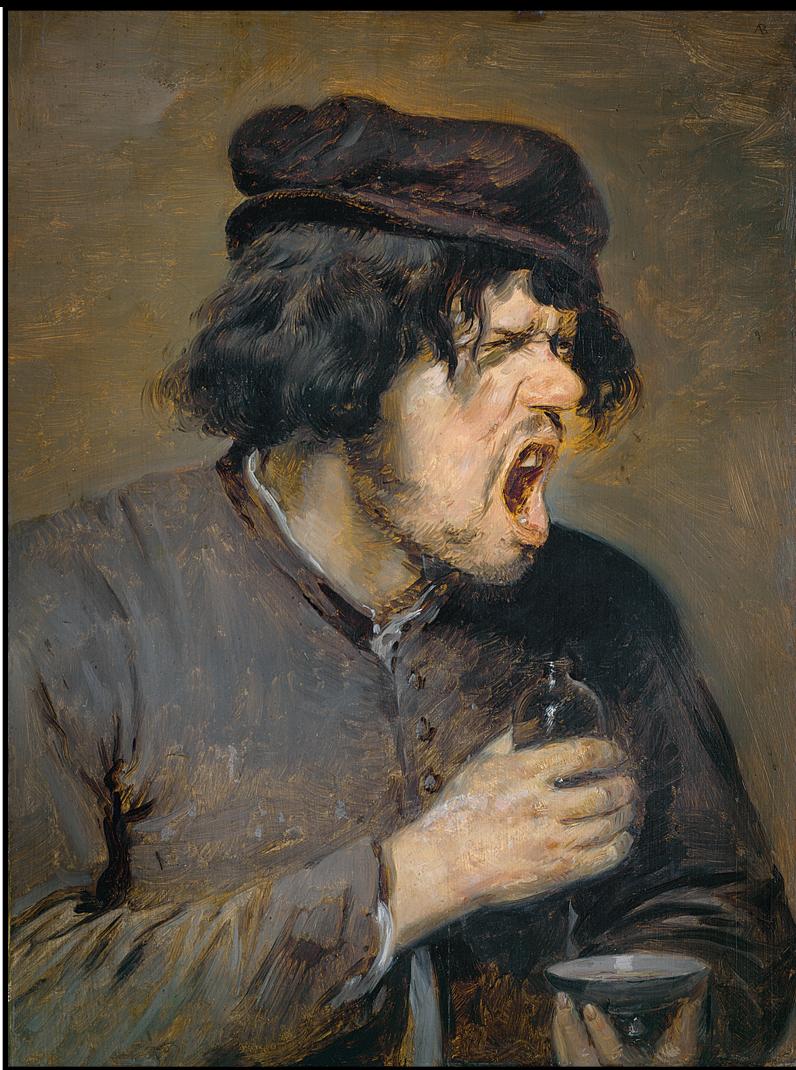
Home cooked meals are good for us, but too often life is busy. We fall back into making the same three or four recipes or getting unhealthy takeout.

Wellio is dedicated to making it more convenient for people to eat better – which means personalizing variety, healthiness, cost and more.

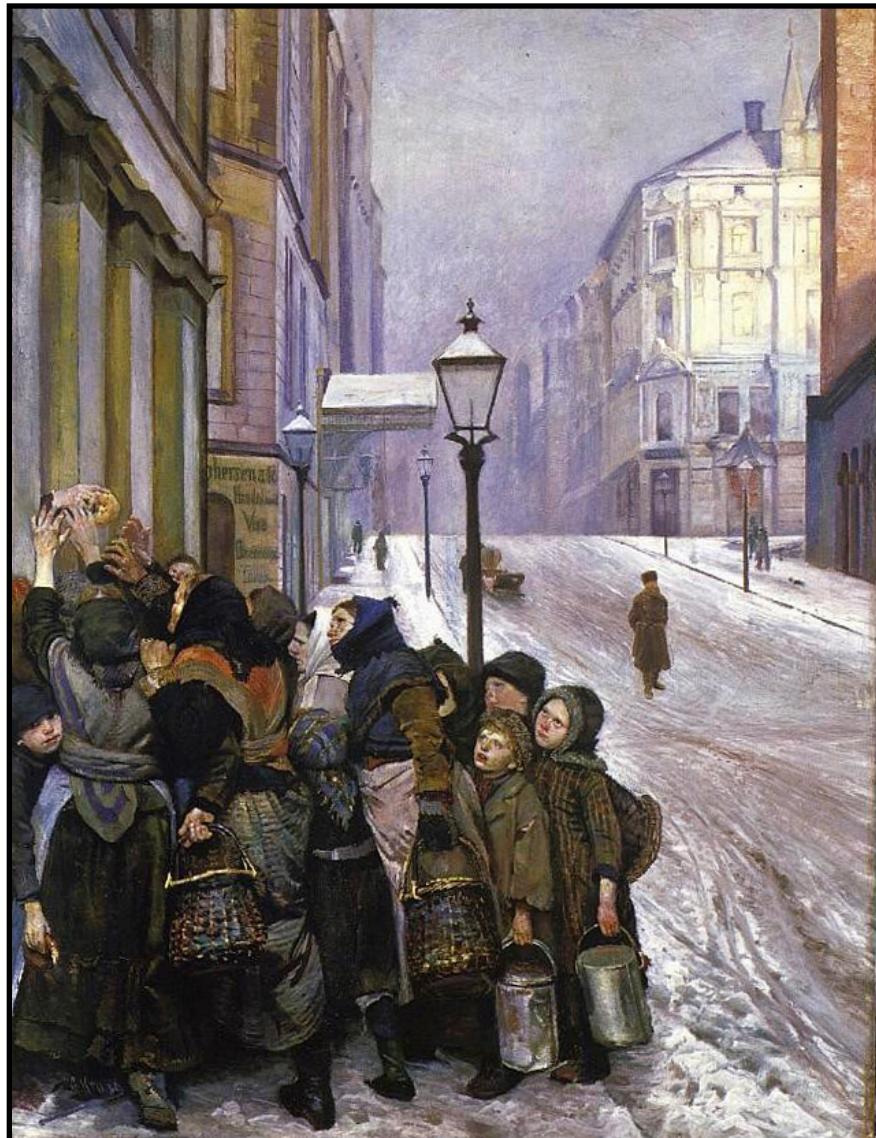
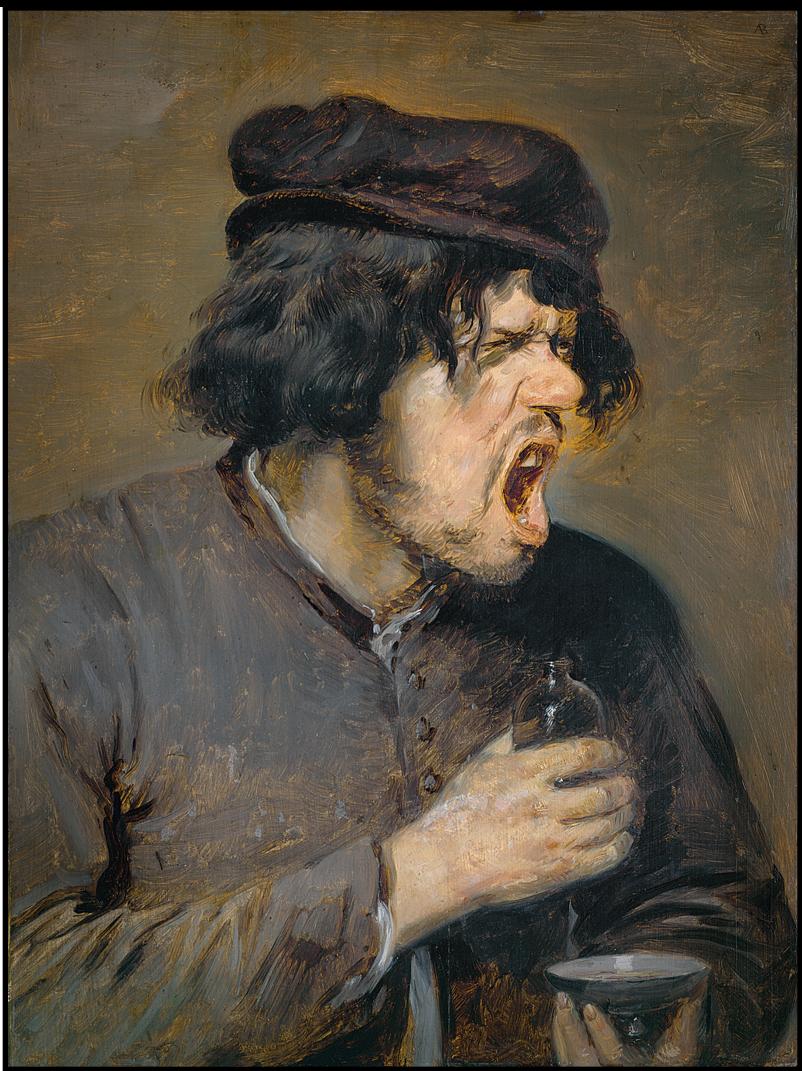
How Can AI Help Answer The Question

»What's For Dinner?

What's For Dinner?



What's For Dinner?



What's For Dinner?



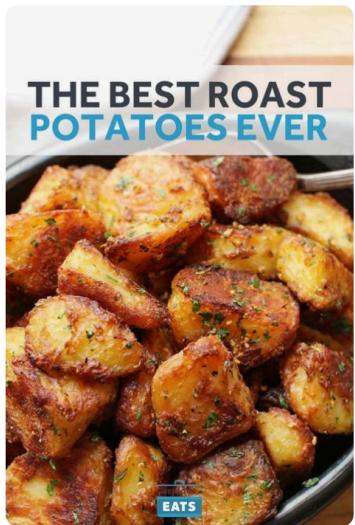
What's For Dinner?



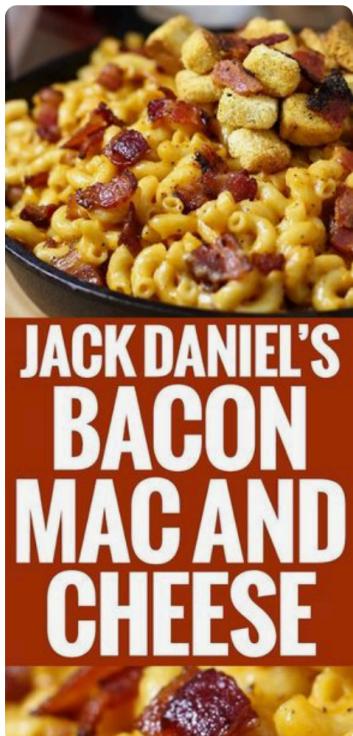
What's For Dinner?

I eat what I eat, ...	<i>M</i>	<i>SD</i>	<i>r_{i(t-i)}</i> ^a	<i>a</i> ^a	<i>a</i> ^b
<i>Liking</i>					
... because I think it is delicious	5.99	0.79	.69	.76	
... because I have an appetite for it	5.68	0.89	.67	.74	.71
... because it tastes good	6.09	0.74	.64	.71	.72
... because I feel like eating it	5.59	0.92	.62	.70	
... because I like it	5.94	0.81	.63	.69	.70
<i>Habits</i>					
... because I eat it regularly	4.76	1.19	.64	.74	
... because I am accustomed to eating it	4.56	1.30	.63	.74	.75
... because I usually eat it	4.63	1.20	.62	.71	.75
... because it is a set part of my diet	5.02	1.24	.54	.57	
... because it is part of my daily diet	5.03	1.27	.52	.56	
... because I am familiar with it	4.78	1.16	.47	.55	.60
<i>Need & Hunger</i>					
... because I need energy	4.77	1.32	.37	.60	.58
... because it is pleasantly filling	4.60	1.23	.34	.48	.54
... because it is easy to digest	4.02	1.35	.18	.39	
... because I'm hungry	5.70	0.95	.22	.31	.39
<i>Health</i>					
... to maintain a balanced diet	4.80	1.31	.67	.80	.81
... because it is healthy	5.03	1.12	.68	.80	.83
... because it keeps me in shape (e.g. energetic, motivated)	4.37	1.37	.63	.70	.68
... in order to fulfill my need for nutrients, vitamins, and minerals	4.73	1.33	.63	.70	
... because it agrees with me	4.64	1.59	.39	.44	
<i>Convenience</i>					
... because it is quick to prepare	4.68	1.21	.75	.86	.87
... because it is the most convenient	4.45	1.29	.71	.82	.82
... because it is easy to prepare	4.73	1.22	.70	.81	.83
... because it is easy and convenient to purchase	4.25	1.36	.55	.60	
... because it is readily available (e.g. at hand or being offered by someone)	4.15	1.33	.36	.39	
<i>Pleasure</i>					
... because I enjoy it	4.67	1.20	.61	.71	.71
... in order to indulge myself	4.32	1.20	.60	.69	.75
... because it puts me in a good mood	4.08	1.42	.57	.66	
... in order to reward myself	3.60	1.35	.53	.65	.69
... because it is fun to eat	4.96	1.31	.43	.51	
<i>Traditional Eating</i>					
... because it belongs to certain situations	3.83	1.31	.43	.72	.72

What's For Dinner?



The Best Roast Potatoes Ever



Jack Daniel's Smoky Bacon Mac and Cheese (With Video)



Chicken Bacon Ranch Grilled Cheese



Parmesan crusted chicken served over bow tie pasta with...

What's For Dinner?

grocery shopping list

- | fruit | notes |
|--------------|-------|
| apples | |
| bananas | |
| oranges | |
| pears | |
| grapes | |
| peaches | |
| plums | |
| lemons | |
| limes | |
| strawberries | |
| blueberries | |
| raspberries | |
| pineapples | |
| | |
| | |

- | vegetables | notes |
|--------------|-------|
| lettuce | |
| cucumbers | |
| tomatoes | |
| bell peppers | |
| carrots | |
| celery | |
| onions | |
| garlic | |
| potatoes | |
| corn | |

- | meat | notes |
|-------------|--------------|
| chicken | |
| turkey | |
| pork | |
| beef | |
| lamb | |

- | dairy & soy | notes |
|--------------|-------|
| eggs | |
| butter | |
| milk | |
| half & half | |
| yogurt | |
| sour cream | |
| cream cheese | |
| tofu | |
| soy milk | |

- | sauces & condiments | notes |
|---------------------|-------|
| oil | |
| vinegar | |
| ketchup | |
| mayonnaise | |
| peanut butter | |
| jelly | |
| tomato sauce | |
| salad dressing | |
| soy sauce | |

- mustard
 - honey
 - syrup
 - salsa
 - guacamole
 - hummus
 - pickles
 - olives
 - relish
 - tartar sauce
 - cocktail sauce

- | canned &
packaged | notes |
|---|-------|
| <input type="checkbox"/> tuna | |
| <input type="checkbox"/> black beans | |
| <input checked="" type="checkbox"/> green beans | |

- | | frozen | notes |
|--------------------------|---------------|--------------|
| <input type="checkbox"/> | ice cream | |
| <input type="checkbox"/> | waffles | |
| <input type="checkbox"/> | dinners | |
| <input type="checkbox"/> | patties | |
| <input type="checkbox"/> | peas | |
| <input type="checkbox"/> | corn | |
| <input type="checkbox"/> | | |

- | baking | | notes |
|--------------------------------------|--|-------|
| <input type="checkbox"/> flour | | |
| <input type="checkbox"/> sugar | | |
| <input type="checkbox"/> baking soda | | |
| <input type="checkbox"/> vanilla | | |
| | | |

- | herbs & spices | notes |
|-----------------------------------|-------|
| <input type="checkbox"/> salt | |
| <input type="checkbox"/> pepper | |
| <input type="checkbox"/> garlic | |
| <input type="checkbox"/> onion | |
| <input type="checkbox"/> oregano | |
| <input type="checkbox"/> thyme | |
| <input type="checkbox"/> cinnamon | |

- need to buy
- all bought

INSTRUCTIONS

There are two ways you can use the Grocery Shopping List.

Option 1

- 1) Common grocery categories and items are listed for you. Adjust these to reflect the items you need to buy.
 - 2) Print the Grocery Shopping List.
 - 3) Bring the list with you on your next shopping trip, and check off the items as you purchase them.

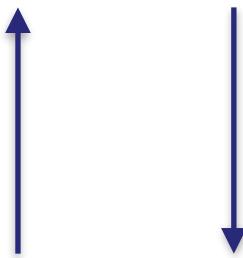
Option 2

- 1) Common grocery categories and items are listed for you. Adjust these to reflect the items you most frequently purchase.
 - 2) Print the Grocery Shopping List.
 - 3) Check the "need to buy" box up top, and check off the items that you need to buy.
 - 4) Bring the list with you on your next shopping trip, and cross off the items as you purchase them.
 - 5) Check the "all bought" box up top.

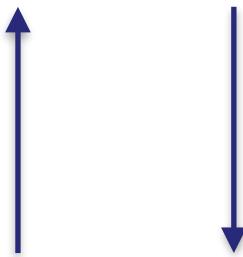
What's For Dinner?



» Meal Planning



» Ingredient Acquisition



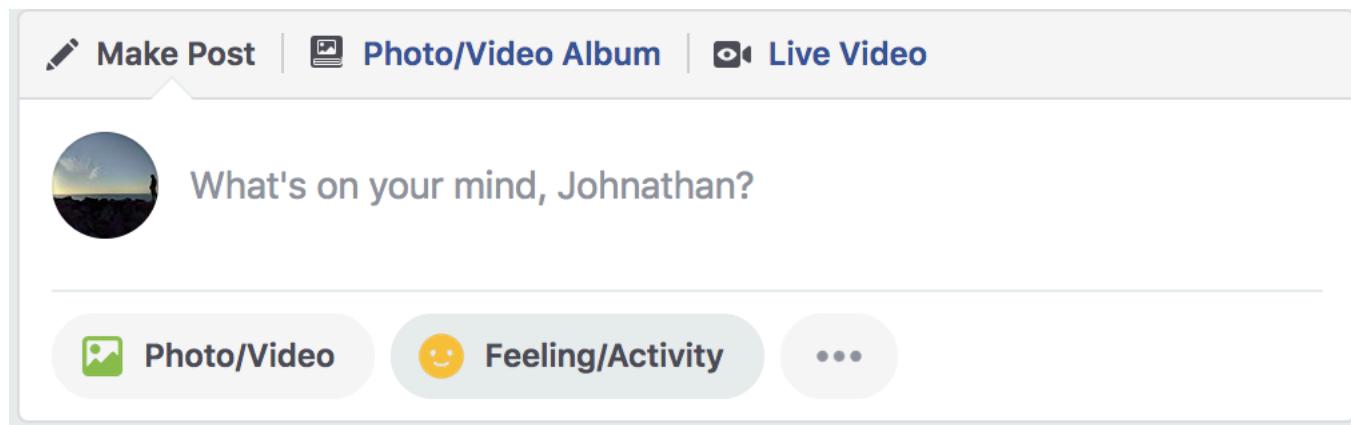
» Cooking Task

- » Introduction
- » How do I interact with AI right now?
- » How to answer ‘What’s For Dinner?’
 - » In general...
 - » Meal Planning
 - » Ingredient Acquisition
 - » Cooking Task
- » Conclusion

- » Both ‘User Experience’ and ‘Artificial Intelligence’ are very broad
- » But maybe we can look at a few examples to get a sense of the flavor
- » What do I see the AI as?
- » How do I interface with the AI?

How Do I Interact with AI Right Now?

» AI as curation...



How Do I Interact with AI Right Now?

» AI as curation...

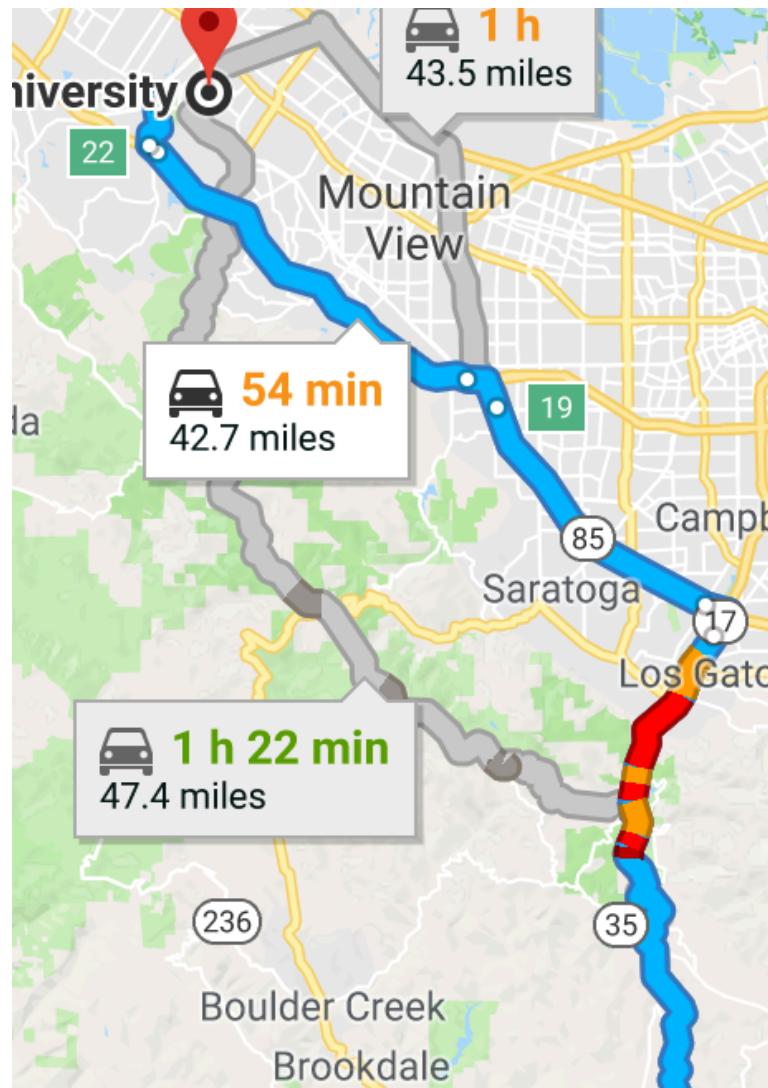
The screenshot shows the Yummly homepage with a search bar at the top. Below the search bar is a navigation menu with categories: JUST FOR YOU (underlined), SEASONAL, POPULAR NOW, QUICK AND EASY, and THE DISH. The main content area displays four recipe cards, each labeled 'Trending Recipe' in a white banner:

- Crock Pot Santa Fe Chicken** by SKINNYTASTE. The image shows a bowl of chicken and rice topped with cheese and green onions.
- Broiled Tilapia Oreganata** by SKINNYTASTE. The image shows a fillet of tilapia with asparagus and a red sauce.
- Stuffed Spaghetti Squash** by ADD A PINCH. The image shows a bowl of spaghetti squash with meat and cheese.
- Skinny Overnight Oats in a Jar** by SKINNYTASTE. The image shows a jar of overnight oats with blueberries and pecans.

Each recipe card includes a 'Yum' button with a count (e.g., 32k, 4k, 4k, 13k) and a small circular icon with a number (e.g., 32k, 4k, 4k, 13k).

How Do I Interact with AI Right Now?

» AI as expert advice...



- » These examples work through my laptop
 - » Keyboard + trackpad + display screen
- » But I could use:
 - » cellphone / tablet
 - » No keyboard, more portable
 - » A voice activated assistant
 - » No keyboard
 - » Maybe no visual display

» Ingredient Representations

knowledge is knowing that a tomato is a fruit

wisdom is not putting it in a fruit salad

That was deep

philosophy is wondering if that means ketchup is a smoothie

That was deeper.

common sense is knowing that ketchup isn't a damn smoothie you nasty

» Ingredient Representations

THE SANDWICH ALIGNMENT CHART

	INGREDIENT PURIST (Must have classic sandwich toppings: meat, cheese, lettuce, condiments, etc.)	INGREDIENT NEUTRAL (Can contain a broader scope of savoury ingredients)	INGREDIENT REBEL (Can contain literally any food products sandwiched together)
STRUCTURE PURIST (A sandwich must have a classic sandwich shape: two pieces of bread/baked product, with toppings in between)	HARDLINE TRADITIONALISTS  "A BLT is a sandwich."	STRUCTURAL PURIST, INGREDIENT NEUTRAL  "A chip butty is a sandwich."	STRUCTURAL PURIST, INGREDIENT REBEL  "Ice cream between waffles is a sandwich."
STRUCTURE NEUTRAL (The container must be on either side of the toppings, but not necessarily two separate pieces)	STRUCTURAL NEUTRAL, INGREDIENT PURIST  "A sub is a sandwich."	TRUE NEUTRAL  "A hot dog is a sandwich."	STRUCTURAL NEUTRAL, INGREDIENT REBEL  "An ice cream taco is a sandwich."
STRUCTURE REBEL (Can contain any food enveloped in any way by a containing food)	STRUCTURAL REBEL, INGREDIENT PURIST  "A chicken wrap is a sandwich."	STRUCTURAL REBEL, INGREDIENT NEUTRAL  "A burrito is a sandwich."	RADICAL SANDWICH ANARCHY  "A Pop-Tart is a sandwich."

» Recipe Representations

VOV

- 4 egg yolks blended together with 200 grams of sugar
- Boil 200 grams of sugar + 2 large glasses of milk (about $\frac{1}{2}$ liter)
- When the milk boils pour over the egg yolks + sugar mixing quickly. -Pour slowly.
- Let cool
- Add $\frac{1}{2}$ glass of Florio Dry Marsala (~100 grams)
- Add 1tsp. of vanilla mixed w/ $\frac{1}{2}$ glass of 160 proof vodka (Double Uvarski)

» Recipe Representations

VOV

- 4 egg yolks blended together with 200 grams of sugar
- Boil 200 grams of sugar + 2 large glasses of milk (about $\frac{1}{2}$ liter)
- When the milk boils pour over the egg yolks + sugar mixing quickly. -Pour slowly.
- Let cool
- Add $\frac{1}{2}$ glass of Florio Dry Marsala (\sim 100 grams)
- Add 1 Tsp. of vanilla mixed w/ $\frac{1}{2}$ glass of 160 proof vodka (double tvarscká)

» Recipe Representations

VOV

- 4 egg yolks blended together with 200 grams of sugar
- Boil 200 grams of sugar + 2 large glasses of milk (about 1/2 liter)
- When the milk boils pour over the egg yolks + sugar mixing quickly. -Pour slowly.
- Let cool
- Add 1/2 glass of Florio Dry Marsala (\sim 100 grams)
- Add 1 Tbsp. of Vanilla mixed w/ 1/2 glass of 160 proof Vodka (Double vodka)

» Recipe Representations

VOV

- 4 egg yolks blended together with 200 grams of sugar
- Boil 200 grams of sugar + 2 large glasses of milk (about $\frac{1}{2}$ liter)
- When the milk boils pour over the egg yolks + sugar mixing quickly. -Pour slowly.
- Let cool
- Add $\frac{1}{2}$ glass of Florio Dry Marsala (~100 grams)
- Add 1tsp. of vanilla mixed w/ $\frac{1}{2}$ glass of 160 proof vodka (Double tvarska)

- » Recipe Representations
 - » More standardized online
 - » ... well, not across food blogs
- » What's the data structure that can hold this info?

» Perceptual Models



In General

» Perceptual Models



What Causes People To Pick The Meal They Want?

- » Meal Planning
- » Ingredient Acquisition
- » Cooking Task

» What if cost / time / skill wasn't a problem?



- » What if cost / time / skill wasn't a problem?
- » Playful Exploration
- » Imagination
 - » 'oh, I think that picture will taste like this..'

Introduction

Casual Creators: what are they?

A Casual Creator is an interactive system that encourages the fast, confident, and pleasurable exploration of a possibility space, resulting in the creation or discovery of surprising new artifacts that bring feelings pride, ownership, and creativity to the users that make them.

Introduction

Casual Creators: what are they?

A Casual Creator is an **interactive system** that encourages the fast, confident, and pleasurable exploration of a possibility space, resulting in the creation or discovery of surprising new artifacts that bring feelings pride, ownership, and creativity to the users that make them.

Introduction

Casual Creators: what are they?

A Casual Creator is an interactive system that encourages the fast, confident, and pleasurable exploration of a possibility space, resulting in the creation or discovery of surprising new artifacts that bring feelings pride, ownership, and creativity to the users that make them.

Introduction

Casual Creators: what are they?

A Casual Creator is an interactive system that encourages the fast, confident, and pleasurable exploration of a possibility space, resulting in the creation or discovery of surprising new artifacts that bring feelings pride, ownership, and creativity to the users that make them.

Introduction

Casual Creators: what are they?

A Casual Creator is an interactive system that encourages the fast, confident, and pleasurable exploration of a possibility space, resulting in the creation or discovery of surprising new artifacts that bring feelings of pride, ownership, and creativity to the users that make them.

- » Social factors
 - » Certain food items indicate social class
- » Emotional / personal factors
 - » Grandma's recipes
- » Weather / environmental factors
 - » Cold foods for hot weather

Ingredient Acquisition

grocery shopping list

- need to buy
 - all bought

INSTRUCTIONS

There are two ways you can use the Grocery Shopping List.

Option 1

- 1) Common grocery categories and items are listed for you. Adjust these to reflect the items you need to buy.
 - 2) Print the Grocery Shopping List.
 - 3) Bring the list with you on your next shopping trip, and check off the items as you purchase them.

Option 2

- 1) Common grocery categories and items are listed for you. Adjust these to reflect the items you most frequently purchase.
 - 2) Print the Grocery Shopping List.
 - 3) Check the "need to buy" box up top, and check off the items that you need to buy.
 - 4) Bring the list with you on your next shopping trip, and cross off the items as you purchase them.
 - 5) Check the "all bought" box up top.

- » Visual / Design metaphors around shopping lists
- » List/know all items beforehand
- » Check items off as you complete them

- » Digital shopping lists
- » Phones / Tablets
- » Low bandwidth
- » Can we do better?

Cooking Task

» How can AI help us to actually cook?



Cooking Task

The current version of the Ambient Kitchen uses RFID technology (embedded in the worktops and the cupboards), a pressure-sensitive floor (under the laminate flooring), multiple flat LCDs screens (behind tinted glass wall covering), and numerous wireless accelerometers embedded into specially adapted utensils. Through this sensing infrastructure the behaviour of users in the kitchen can be tracked and reasoned about.

Cooking Task

- » Kitchens are not a great place for computers



Cooking Task

- » Kitchens are not a great place for computers



Cooking Task

- » Kitchens are not a great place for computers



Cooking Task

- » Kitchens are not a great place for books either



- » Long-scale conversations
 - » listening for voice-activated assistants
- » Active correction / recommendations without a sea of sensors?
- » Parallelize tasks to optimize for speed?
 - » What about difficulty?

- » Things I haven't Even Touched On Yet:
 - » Food Deserts
 - » Group tasks in the kitchen
 - » Interventions in Domestic Labor
 - » Disabilities

Conclusion

- » The kitchen is a fruitful place for AI
- » The challenges aren't completely unique, but emblematic of different ways to approach AI

Thank you for your time!

tinyai.net
@jag_pag

