Making your research make sense:

quick tips for talking to non-experts

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NISS Graduate Student Research Conference: June 13, 2021

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quick tips for talking to ~~non-experts~~ *ALIENS*

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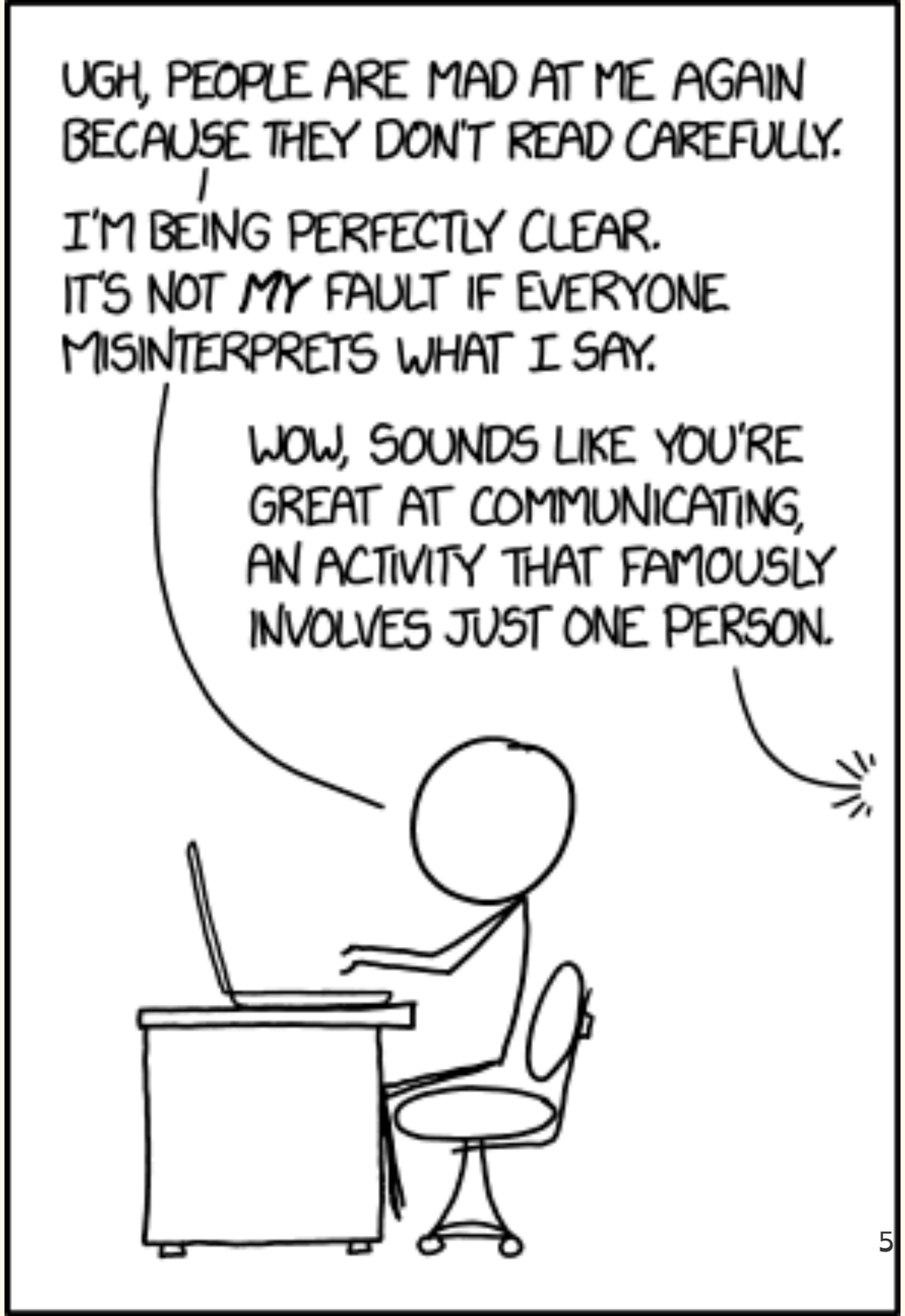
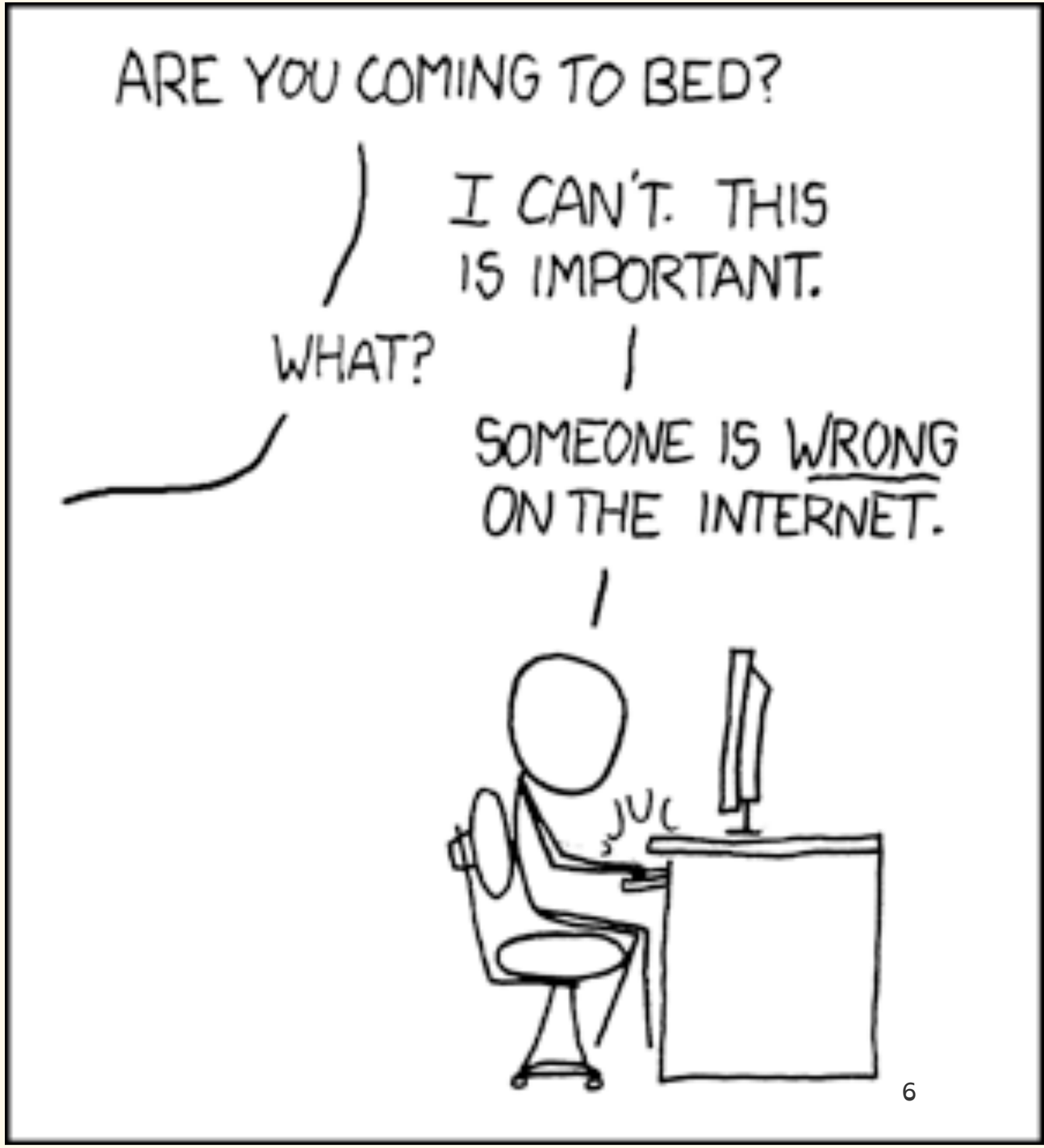
The Situation

when we try to talk to non-experts

Me, often:



Also me:



The Underlying Problem

(one of them, at least)

The Curse of Knowledge

"The main cause of incomprehensible prose is the difficulty of imagining what it's like for someone else not to know something that you know."

— Steven Pinker, *The Sense of Style: The Thinking Person's Guide to Writing in the 21st Century*

Why We Care

Because non-experts may . . .

👽 be the ones signing the check 💸

Because non-experts may . . .

👽 be the ones signing the check 💸

👽 have power that can affect the world 🌍

Because non-experts may . . .

👽 be the ones signing the check 💸

👽 have power that can affect the world 🌍

👽 don't know much but are still smart and curious 🔥 🔥

Solutions

to play around with

#1. Our Mindset

To be an ideal communicator, overestimate the intelligence of your audience, and underestimate their knowledge.

— My adaption of a 1923 quote from American magazine editor Glenn Frank

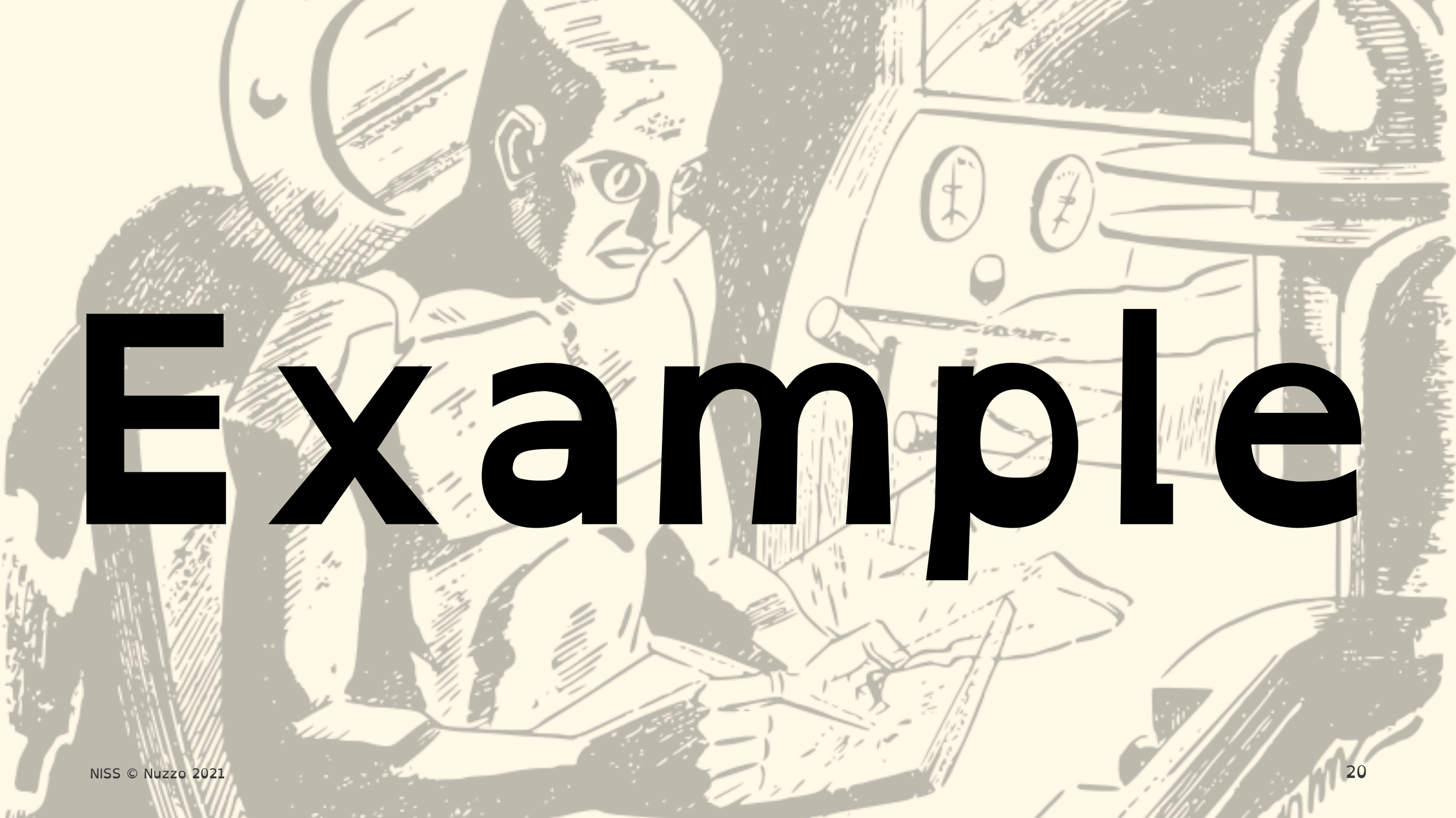
“The ideal magazine article should be written as if the men and women who were to read it had just dropped from the planet Mars.”

— more from Glenn Frank in 1923

#2. Templates

Try this easy problem template

1. What is the **SETTING**?
2. What is the **PROBLEM**?
3. **SO WHAT**?
4. What are the **SOLUTIONS** I'm proposing?
5. What are **EXAMPLES**, **BENEFITS**, and/or **NEXT STEPS**?



Example

Prep step:

get your ideas down in whatever form you can,

then simplify or break apart each thought

Intravenous busulfan is a standard component of the preparative regimen in allogeneic stem cell transplantation (allosct) for acute leukemia. Systemic busulfan exposure, characterized by the area under the plasma concentration curve, AUC, is strongly associated with clinical outcome. A high AUC is associated with severe toxicities, while a low AUC carries risks of disease recurrence and graft failure. An optimal AUC interval is determined for each patient by giving a preclinical dose. To determine if the optimal AUC interval varies with individual patient characteristics, we developed a method for determining covariate-specific, personalized AUC intervals. We used a Bayesian nonparametric survival regression model based on a dependent Dirichlet process and Gaussian process prior (DDP-GP) to analyze data from 151 allosct patients. The fitted model identified optimal AUC intervals that varied with age and whether the patient was in complete remission at transplant. Simulations showed that the DDP-GP model's performance compares favorably with several robust alternative models. An R package, DDPGPSurv, for general implementation of the DDP-GP survival regression model is provided.

SETTING

- A drug called busulfan is used in stem cell bone marrow transplants for leukemia.
- The dosage can affect the patient's health outcome.

PROBLEM

- But doctors don't have a good way to determine the ideal dosage.

WHY WE CARE

- This is important because too much of the drug can be toxic, and too little can lead to the cancer returning.

SOLUTION

- So we developed a way to personalize an optimal dosage for each patient.
- We used {a sophisticated statistical model} to analyze data from 151 leukemia patients.

BENEFITS

- Our method personalizes dosage for each patient based on age and whether their cancer was in remission, so it's easy to use.
- Our simulations suggest the method can extend many patients' lives dramatically.
- For example, 40- to 60-year-olds in remission can live 10 to 14 months longer than using the old dosaging method.

1. **SETTING** Treating blood cancers like leukemia sometimes calls for the patient to receive a bone marrow transplant, which requires a special drug called busulfan.

2. **PROBLEM** It’s tricky to get the drug's exact dosage correct, however.

3. **SO WHAT** Too much busulfan can lead to toxicity or even death, while too little can make it easier for the cancer to return.

4. **SOLUTION** In this presentation, the researchers will describe the new “precision medicine” statistical model that they created to determine the right dosage for any patient, resulting in a method that be easily used by any transplant doctor.

5. **BENEFITS** Simulations show that by switching from the current “one-size-fits-all” strategy to the new method, doctors could extend many patients’ lives dramatically — by an average of 10 to 14 months, for example, for 40- to 60-year-olds in complete remission, which is an improvement of up to 290%.

Another template

-- this one even simpler

Something **AND** something else,

BUT a complication,

THEREFORE a resolution

A drug is needed to treat leukemia AND

the dosage is critical

BUT it's still one-size-fits-all

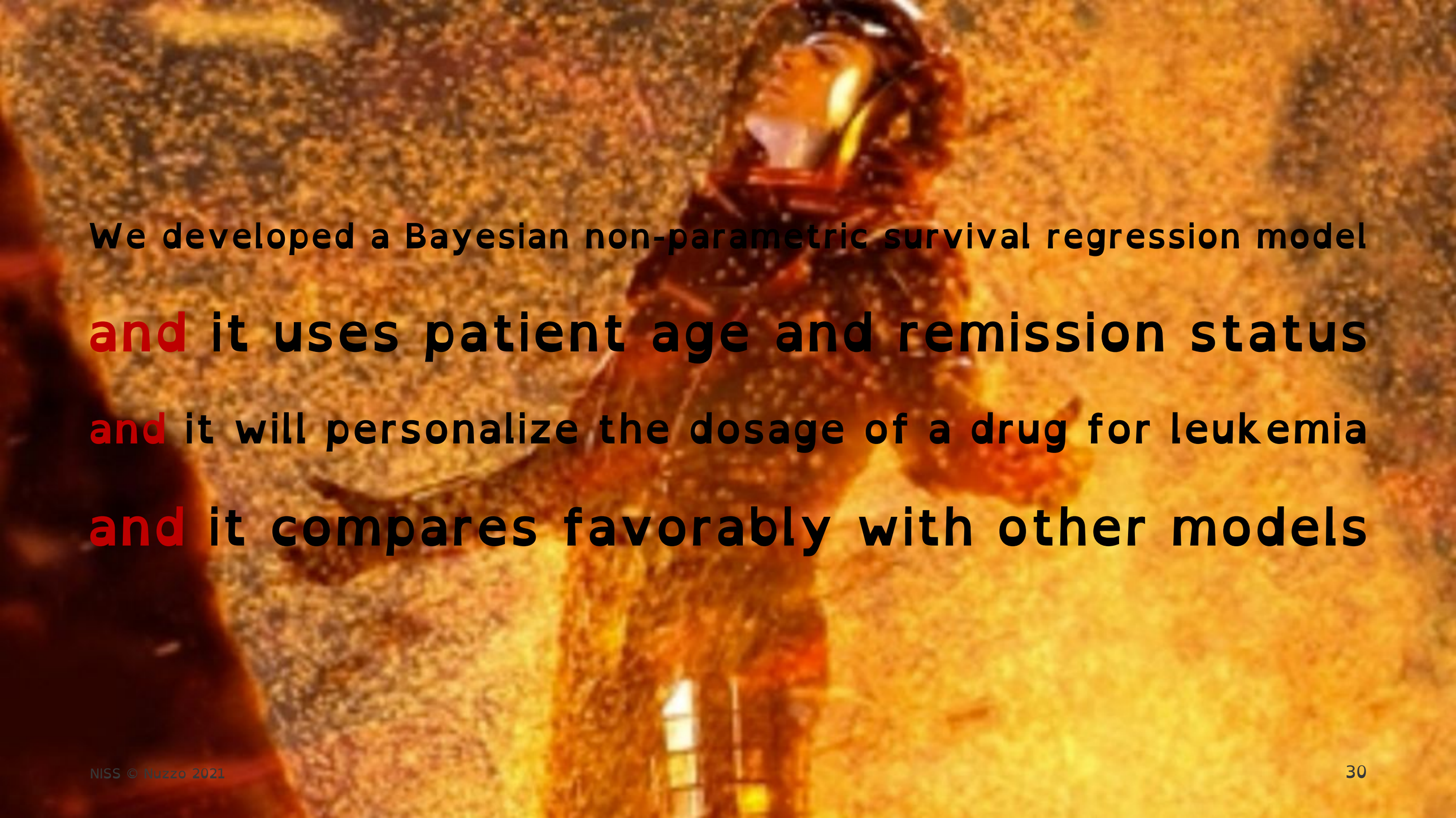
SO we created a way to personalize

We developed a Bayesian non-parametric survival regression model

and it uses patient age and remission status

and it will personalize the dosage of a drug for leukemia

and it compares favorably with other models


We developed a Bayesian non-parametric survival regression model
and it uses patient age and remission status
and it will personalize the dosage of a drug for leukemia
and it compares favorably with other models

Two More Examples (from this conference!)

Wind is important for many fields[1] AND modeling its variability is important

BUT wind speed and direction are hard to model[2]

SO here we will discuss modeling strategies[3]

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[1] such as renewable energy and air-traffic control

[2] because wind data are sparse, massive, and complex

[3] Eva Murphy, Clemson University, Modeling of Wind Speed and Wind Direction

Data on how gene expressions change over time are cool[4] **AND**

finding genes with similar patterns is useful[5]

BUT this is a hard task[6]

SO here we will propose a solution[7] [8]

---

[4] because they help us understand immune response and disease progression

[5] because these genes often share similar biology

[6] because the data are high-dimensional and nonlinear

[7] a Bayesian approach to estimating ODE models of gene expression

[8] Sara Venkatraman, Cornell University, A Bayesian dynamical systems approach to clustering gene expression time series data

Templates Recap

1. What is the **SETTING**?
2. What is the **PROBLEM**?
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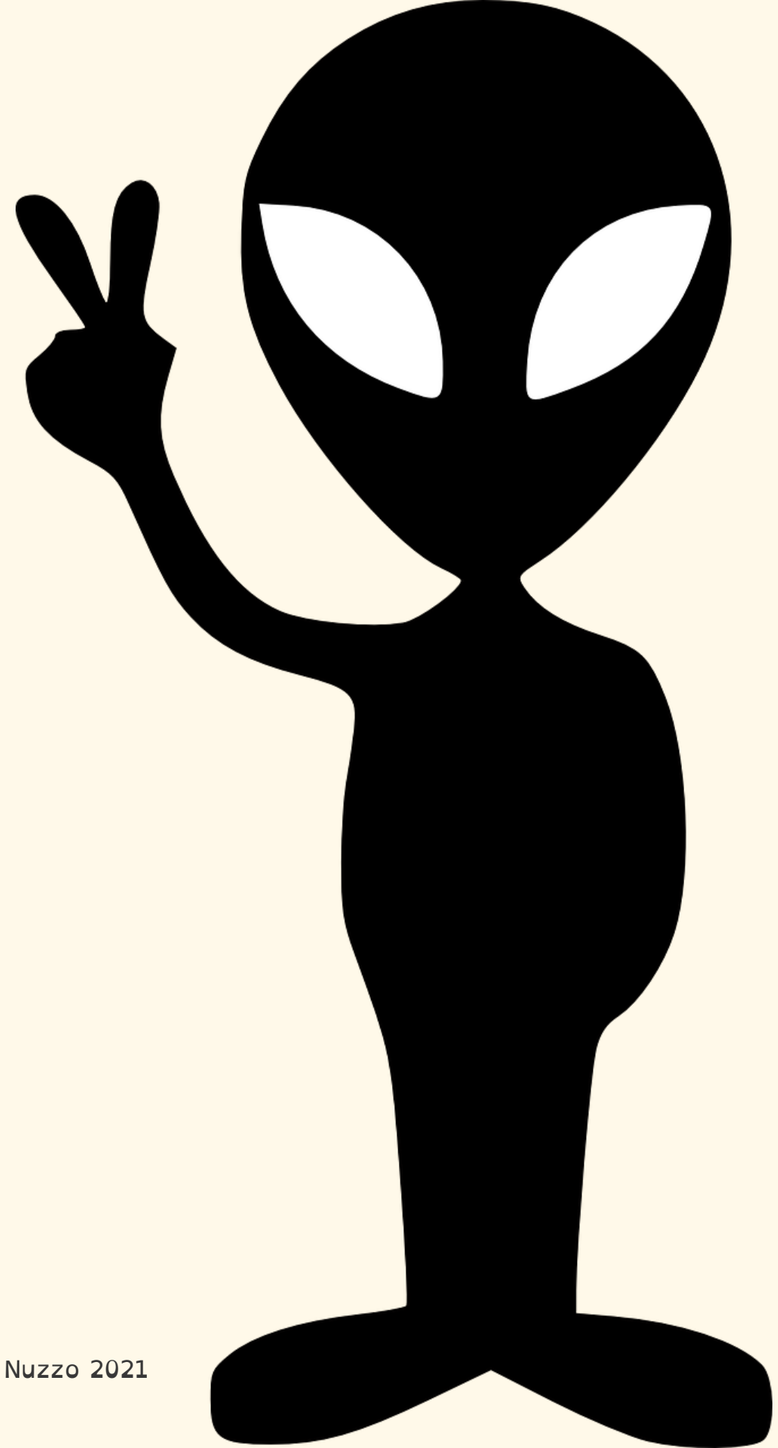
Something **AND** something else,

BUT a complication,

THEREFORE a resolution

Hint: this helps with structuring talks, too!

- **SETTING**: xkcd: People are wrong!
- **PROBLEM**: Curse of knowledge
- **SO WHAT**: We need those ignorant people
- **SOLUTIONS**: Mindset + Templates
- **DETAILS**: Real examples



Thank you!

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