2023-2024

AFCEA Bethesda Case Study Competition

Health IT Summit| January 2024

AI-Expedited ASPR Grants

Joshua Chambers, Pooja Jakkampudi, Antonia Meier, Elijah Muzzi, Esha Vaidya

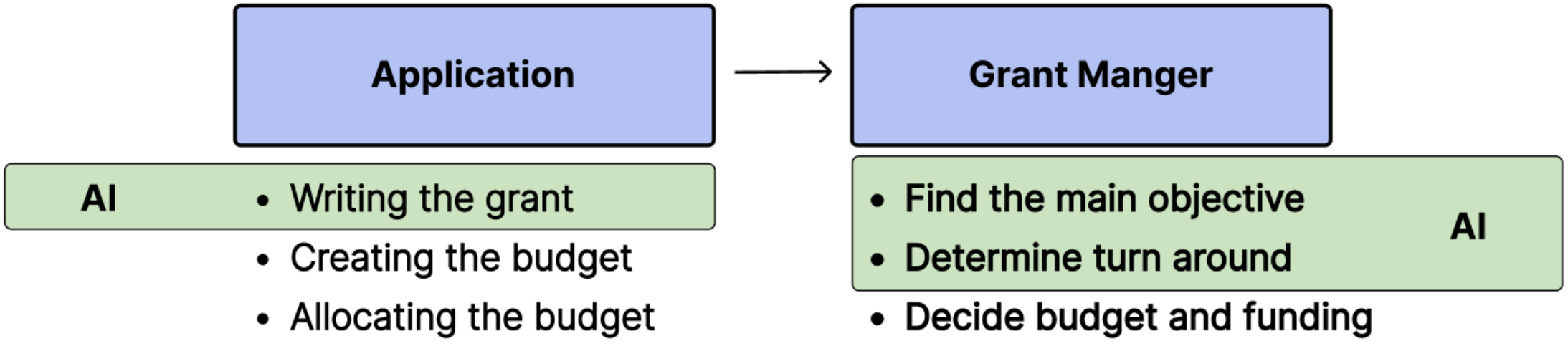
Health IT Summit| January 2024

WASHINGTON & JEFFERSON COLLEGE

Administration for Strategic Preparedness and Response (ASPR)

- **What is ASPR?**
- Health emergencies or pandemics (COVID-19)
  - Prepare …
  - Respond …
  - Recover …

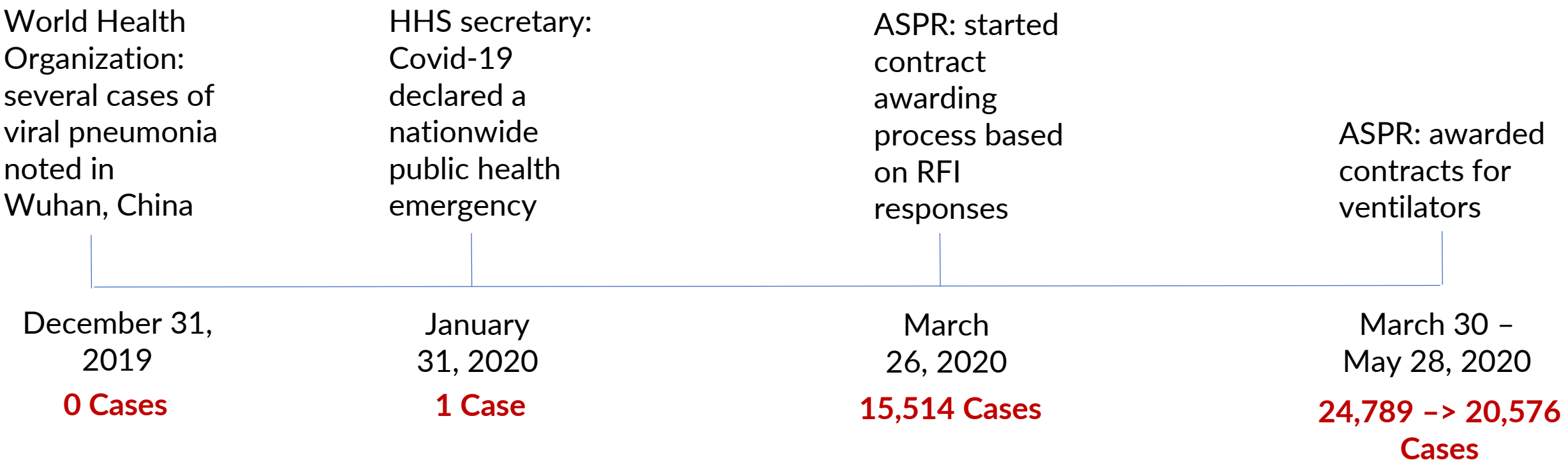
Bottlenecks with Current Grant Process



Where ASPR Can Improve

There is a prolonged time-period between public health emergencies and ASPR grant dispersal.

Where ASPR Can Improve [5, 15]



Our Vision for AI

Phase 1	Phase 2	Phase 3
Proposal Selection	**Proactive Initiation of Grant Process**	**Proposal Generation**
Custom fine-tuned UmlsBERT	Incorporation of AI into NSSP	Develop GenAI and engineer general prompt
Classify grants based on impact	Increasing database of NSSP	Retraining grant writer
Retraining grant manager to review proposals and validate classifications	Training grant manager to monitor	Generate proposal template
	Development of relief fund	Wait until technology enables a cheap creation of secure LLM

Our Vision for AI

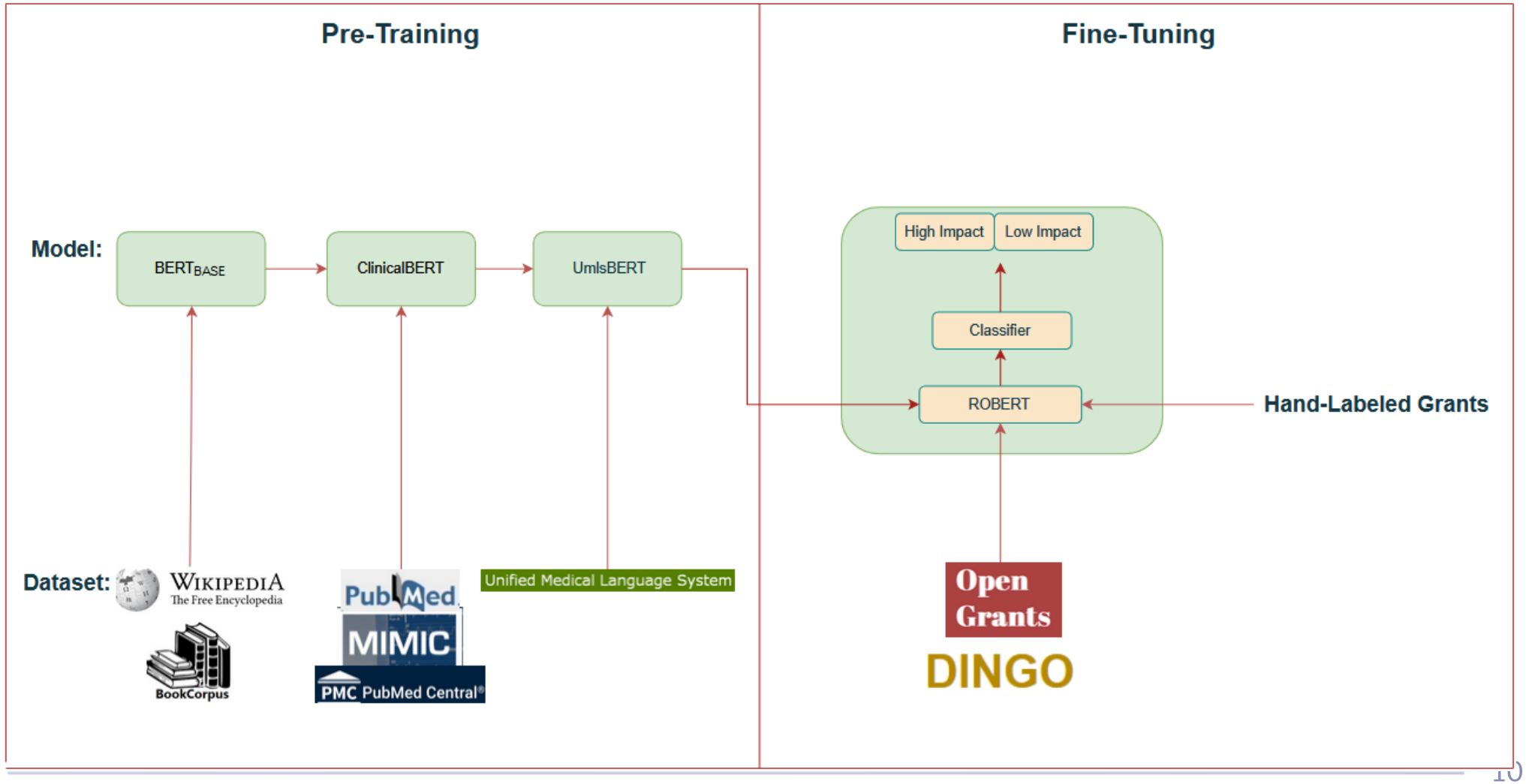
Phase 1	Phase 2	Phase 3
Proposal Selection	**Proactive Initiation of Grant Process**	**Proposal Generation**
Custom fine-tuned UmlsBERT	Model Selection	Develop GenAI and engineer general prompt
Classify grants based on impact	Increasing database of NSSP	Retraining grant writer
Retraining grant manager to review proposals and validate classifications	Training grant manager to monitor	Generate proposal template
	Development of relief fund	Wait until technology enables a cheap creation of secure LLM

Phase 1: BERT as a Language Model

Existing Model - **B**idirectional **E**ncoder **R**epresentations from **T**ransformers

- A Natural Language Processor
- Self-Attention Mechanism
- Masked language model
- Versions of BERT
  - ClincalBERT
    - Trained using medical data and Literature
  - UlmsBERT
    - Built from clincalBERT with the addition of Unified Medical Language System

Phase 1: Determine Which Grants are "High Impact"



Our Vision for AI

Phase 1	Phase 2	Phase 3
Proposal Selection	**Proactive Initiation of Grant Process**	**Proposal Generation**
Custom fine-tuned UmlsBERT	Model Selection	Develop GenAI and engineer general prompt
Classify grants based on impact	Increasing database of NSSP	Retraining grant writer
Retraining grant manager to review proposals and validate classifications	Training grant manager to monitor	Generate proposal template
	Development of relief fund	Wait until technology enables a cheap creation of secure LLM

Phase 2: Proactive Initiation of Grant Process [7]

Physicians as sensors: National Syndromic Surveillance Program (NSSP)

↓

Processing of symptoms/markers against database of existing symptoms/markers linked to certain diseases using a **deep learning classifier**

↓

Alarm raised by NSSP and monitored by grant manager, followed by immediate dispersal of **relief fund**

Our Vision for AI

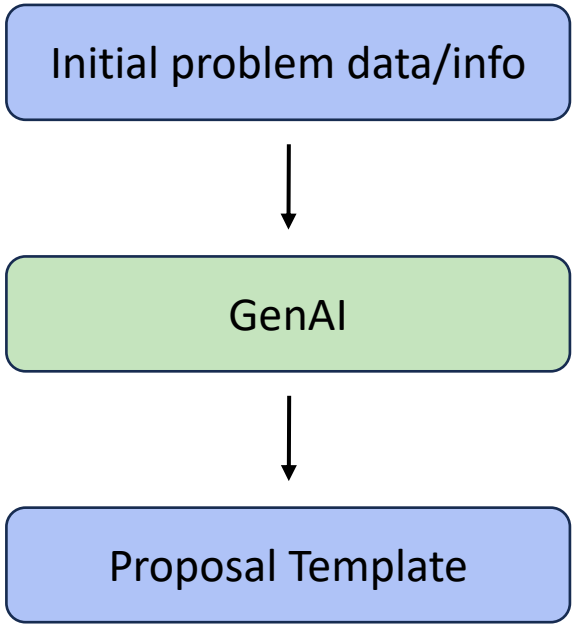
Phase 1	Phase 2	Phase 3
Proposal Selection	**Proactive Initiation of Grant Process**	**Proposal Generation**
Custom fine-tuned UmlsBERT	Model Selection	Develop GenAI and engineer general prompt
Classify grants based on impact	Increasing database of NSSP	Retraining grant writer
Retraining grant manager to review proposals and validate classifications	Training grant manager to monitor	Generate proposal template
	Development of relief fund	Wait until technology enables a cheap creation of secure LLM

Phase 3: Proposal Generation

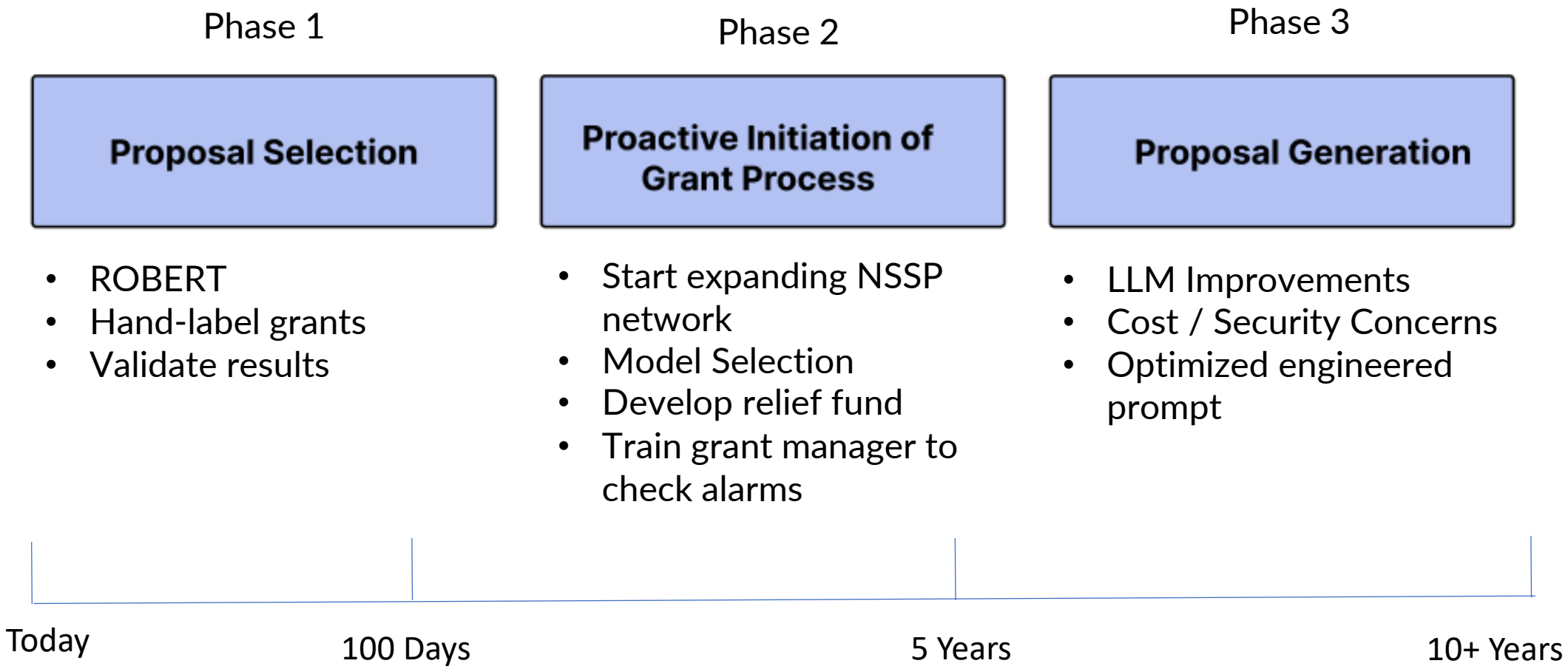
Goal: Speed up grant proposal process

- Use GenAI to create a proposal template based off an engineered prompt

> You are a federal grant drafting AI assistant.
> Your task is to use the provided information to draft a written request template to a grant manager
> Given the hospital/medical entity basic information form delimited
> Generate a template written request to a grant manager
> Write in a concise and professional tone.
> Sign the message as 'ASPR Emergency Grant AI agent`.



Timeline


Phase 1
Proposal Selection
• ROBERT
• Hand-label grants
• Validate results
Phase 2
Proactive Initiation of Grant Process
• Start expanding NSSP network
• Model Selection
• Develop relief fund
• Train grant manager to check alarms
Phase 3
Proposal Generation
• LLM Improvements
• Cost / Security Concerns
• Optimized engineered prompt
Today
100 Days
5 Years
10+ Years

Short and Long-Term Deliverables

- **Goal**: Expedite grants for public health emergencies

- **Phase 1:**
  - Impact Classifier
  - AI-assisted grant request process
- **Phase 2:**
  - Expanding database
  - Relief fund
  - Catch & contain outbreaks quickly
  - Begin research early

Thank you!

References

1.Centers for Disease Control and Prevention. (2023a, September 20). *Overview*. Centers for Disease Control and Prevention. https://www.cdc.gov/nssp/overview.html#:~:text=By%20tracking%20symptoms%20of%20patients,whether%20a%20response%20is%20warranted.

2. Centers for Disease Control and Prevention. (2023b, September 20). *Overview*. Centers for Disease Control and Prevention. https://www.cdc.gov/nssp/overview.html

3. Devlin, J., Chang, M.-W., Lee, K., & Toutanova, K. (2019, May 24). *Bert: Pre-training of deep bidirectional Transformers for language understanding*. arXiv.org. https://arxiv.org/abs/1810.04805

4. Fhirfly. (2023, July 5). *Transforming healthcare: Clinicalbert and UMLSBERT's role in predicting medical codes from...* Medium. https://medium.com/@fhirfly/transforming-healthcare-clinicalbert-and-umlsberts-role-in-predicting-medical-codes-from-a6321515d443

5. Frontz, A. J. (2022, September). HHS did not fully comply with federal requirements and ... https://oig.hhs.gov/oas/reports/region2/22002002.pdf

6. Grants management. Grants.gov. (n.d.). https://www.grants.gov/learn-grants/grant-careers/grants-management.html

7. Henning, K. J. (2004, September 24). *Overview of syndromic surveillance what is syndromic surveillance?*. Centers for Disease Control and Prevention. https://www.cdc.gov/mmwr/preview/mmwrhtml/su5301a3.htm

8. Hospital Preparedness Program (HPP). Use of hospital preparedness program funds. (n.d.). https://aspr.hhs.gov/HealthCareReadiness/HPP/Pages/Use-of-Hospital-Preparedness-Program-Funds.aspx

9. Imasogie, N. (2023, January 17). *Clinicalbert: Using deep learning transformer model to predict hospital readmission*. Medium. https://medium.com/nwamaka-imasogie/clinicalbert-using-deep-learning-transformer-model-to-predict-hospital-readmission-c82ff0e4bb03

10. kexinhuang12345. (n.d.). *KEXINHUANG12345/Clinicalbert: Clinicalbert: Modeling clinical notes and predicting hospital readmission (chil 2020 workshop)*. GitHub. https://github.com/kexinhuang12345/clinicalBERT

11. Lutkevich, B. (2020, January 27). *What is Bert (language model) and how does it work?*. Enterprise AI. https://www.techtarget.com/searchenterpriseai/definition/BERT-language-model#:~:text=BERT%2C%20which%20stands%20for%20Bidirectional,calculated%20based%20upon%20their%20connection.

12. MSc., D. A. (2023, March 6). *Maximizing the potential of latent Dirichlet allocation in natural language processing for topic modelling*. LinkedIn. https://www.linkedin.com/pulse/maximizing-potential-latent-dirichlet-allocation-david-adamson-mbcs/

13. Muller, B. (2022, March 2). *Bert 101 - state of the art NLP model explained*. BERT 101 - State Of The Art NLP Model Explained. https://huggingface.co/blog/bert-101

14. Regional Disaster Health Response System. Criteria. (n.d.). https://aspr.hhs.gov/RDHRS/Pages/criteria.aspx

15. United States - COVID-19 overview - johns hopkins. Johns Hopkins Coronavirus Resource Center. (2023, March 10). https://coronavirus.jhu.edu/region/united-states