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AI-Powered Cyber Workforce Development



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Senior Software Engineer, Game Plan Tech



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Agenda

01

Cultivating NextGen Cyber Warriors

02

AI Student: A Use Case

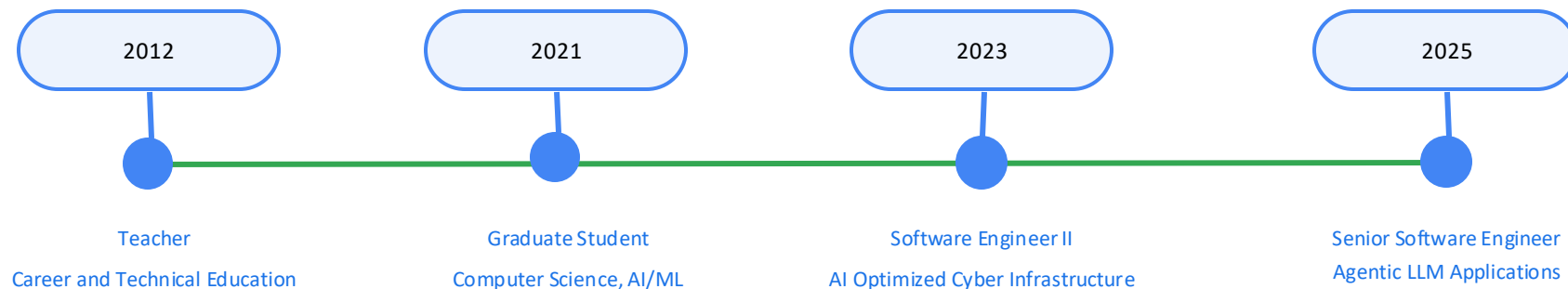
03

AI Student: Under the Hood

04

AI Student: Future Work

Hello,
I am **Danny Mathieson.**





Cultivating NextGen Cyber Warriors

DoD 8140 Qualification Program

Establishes a comprehensive approach for cyber workforce talent management. It establishes enterprise baseline standards for qualification that directly support operational needs and workforce readiness.

Tenant 1

Role-Based Progression

- ★ Aligned to DCWF work roles
- ★ 3 levels of proficiency

Tenant 2

Verification of Knowledge

- ★ Education, training, or certification
- ★ Personnel and component flexibility

Tenant 3

Verification of Capability

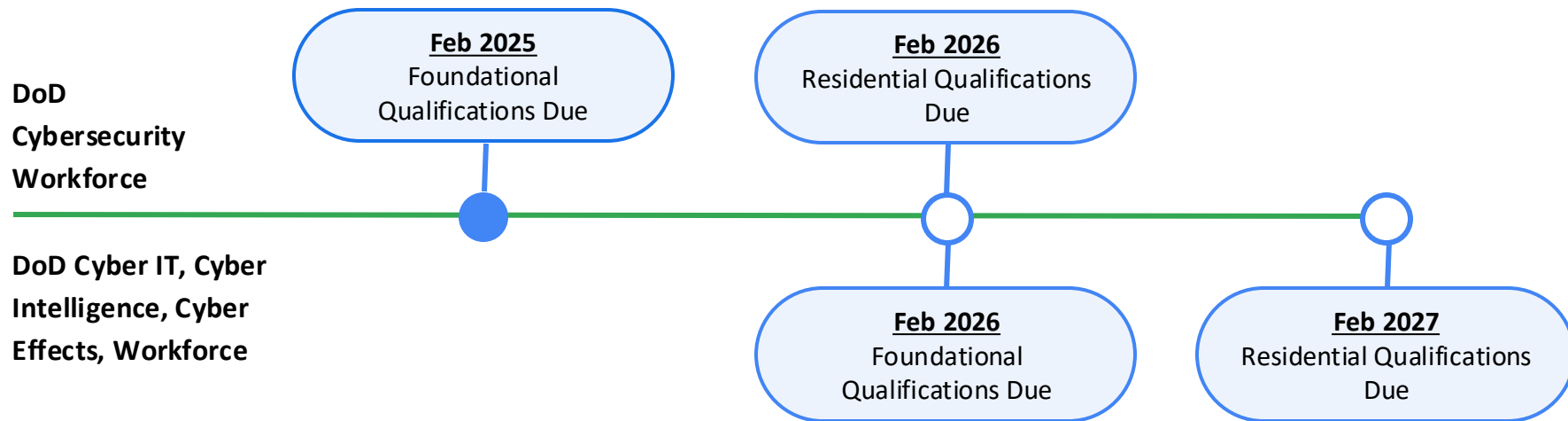
- ★ On-the-Job qualification
- ★ Environment specific requirements

Tenant 4

Continuous Professional Dev.

- ★ 20 hours of professional development
- ★ Evolves to meet changing environments

DoD 8140 Implementation Timeline



CYBER IT (OPR: DoD CIO)

- (411) Technical Support Specialist
- (421) Database Administrator
- (431) Knowledge Manager
- (441) Network Operations Specialist
- (451) Systems Administrator
- (632) Systems Developer
- (641) Systems Requirements Planner
- (651) Enterprise Architect
- (661) Research and Development (R&D) Specialist
- (671) System Testing & Evaluation (T&E) Specialist

INTEL (CYBER) (OPR: OUSD I&S)

- (111) All-Source Analyst
- (151) Multi-Disciplined Language Analyst
- (311) All-Source Collection Manager
- (312) All-Source Collection Requirements Manager
- (331) Cyber Intelligence Planner

CYBERSECURITY (OPR: DoD CIO)

- (212) Cyber Defense Forensics Analyst
- (462) Control Systems Security Specialist
- (511) Cyber Defense Analyst
- (521) Cyber Defense Infrastructure Support Specialist
- (531) Cyber Defense Incident Responder
- (541) Vulnerability Assessment Analyst
- (611) Authorizing Official/Designated Representative
- (612) Security Control Assessor
- (622) Secure Software Assessor
- (631) Information Systems Security Developer
- (652) Security Analyst
- (722) Information Systems Security Manager (ISSM)
- (723) Communications Security (COMSEC) Manager

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CYBER ENABLERS (OPR: DoD CIO)

- (732) Privacy Compliance Manager
- (751) Cyber Workforce Developer and Manager
- (752) Cyber Policy and Strategy Planner
- (901) Executive Cyber Leader
- (711) Cyber Instructional Curriculum Developer
- (712) Cyber Instructor
- (211) Forensics Analyst
- (221) Cyber Crime Investigator
- (731) Cyber Legal Advisor
- (801) Program Manager
- (802) IT Project Manager
- (803) Product Support Manager
- (804) IT Investment/Portfolio Manager
- (805) IT Program Auditor

CYBER EFFECTS (OPR: OUSD PCA)

- (121) Exploitation Analyst
- (122) Digital Network Exploitation Analyst (DNEA)
- (131) Joint Targeting Analyst (JTA)
- (133) Target Analyst Reporter (TAR)
- (321) Access Network Operator (ANO)
- (322) Cyberspace Operator
- (332) Cyber Operations Planner
- (442) Network Technician
- (443) Network Analyst
- (463) Host Analyst

One unlisted Cyber work role is not for public release (CUI)

SOFTWARE ENGINEERING (OPR: OUSD R&E)

- (461) Systems Security Analyst
- (621) Software Developer
- (625) Product Designer User Interface (UI)
- (626) Service Designer User Experience (UX)
- (627) Development, Security, Operations (DevSecOps) Specialist
- (628) Software/Cloud Architect
- (673) Software Test & Evaluation Specialist
- (806) Product Manager

DATA/AI (OPR: DoD CDAO)

- (422) Data Analyst
- (423) Data Scientist
- (424) Data Steward
- (623) Artificial Intelligence / Machine Learning (AI/ML) Specialist
- (624) Data Operations Specialist
- (653) Data Architect
- (672) AI Test & Evaluation Specialist
- (733) AI Risk & Ethics Specialist
- (753) AI Adoption Specialist
- (902) AI Innovation Leader
- (903) Data Officer

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(411) Technical Support Specialist					
		Basic	Intermediate	Advanced	NOTES
Foundational Qualification Options*	Education	A BS degree in Information Technology, Cybersecurity, Data Science, Information Systems, or Computer Science, from an ABET accredited or CAE designated institution fulfills the educational requirement for this WRC	A BS degree in Information Technology, Cybersecurity, Data Science, Information Systems, or Computer Science, from an ABET accredited or CAE designated institution fulfills the educational requirement for this WRC	TBD	For additional information pertaining to ABET: www.abet.org or CAE: www.caecommunity.org
		OR	OR	OR	
	DoD/Military Training	E3AQR3D0X2 02AA or E3AQR3D032 00BB or C-150-2012 or C-150-2011 or 531-25B10 (CP) or A-202-2100 now A-150-1251 or A-150-1200 or A-150-1201 or A-102-5900 or A-531-0767	M09DSJ1 or A-531-0021 or A-150-1980 or A-150-1202 or A-150-1203 or A-150-1250 or A-150-1855 / A-150-1940 or A-113-0205 or A-113-0175 or A-113-0018 or A-113-0382 or A-113-0027 or A-113-0383 or A-113-0175 or A-113-0202 or A-113-0233 or A-531-0150 or A-531-0100 or A-150-2300	A-661-0500 or A-531-0022 or A-102-5888 or A-102-5599 (SNOOP) or A-531-0045 or A-113-0381 or A-113-0381 or A-113-0342 or A-104-0083(P/L) or A-121-0594 (P/L) or A-104-0084 or A-150-4219 (P/L) or A-150-9020 (P/L)	See TAB C (DCWF Training Repository) for additional course information.
	Commercial Training				
*Training/Certifications/Education aligned to higher proficiency levels can qualify lower proficiency levels		OR	OR	OR	
	Personnel Certification	A+ or Network+	CND or FITSP-O or GFACT or GSEC or Security+	CASP+ or CCNP Security or CISA or FITSP-O or GICSP or SSCP	See the Certification Index tab at the end of this document for certification vendor information.
Foundational Qualification Alternative	Experience	Conditional Alternative	Conditional Alternative	Conditional Alternative	Refer to Section 3 of the DoD 8140 Manual for more information.
Residential Qualification	On-the-Job Qualification	Always Required	Always Required	Always Required	Individuals must demonstrate capability to perform their duties in their resident environment.
	Environment-Specific Requirements	Component Discretion	Component Discretion	Component Discretion	
Annual Maintenance	Continuous Professional Development	Minimum of 20 hours annually or what is required to maintain certification; whichever is greater.	Minimum of 20 hours annually or what is required to maintain certification; whichever is greater.	Minimum of 20 hours annually or what is required to maintain certification; whichever is greater.	

The DoD 8140 Challenge



Scale

- ★ ~225,000+ military, civilian, and contractor positions
- ★ 72 defined work roles require qualification under DoDM 8140.03



Complex Matrices

- ★ Each work role requires specific foundational and residential qualifications
- ★ 3 levels of proficiency within each matrix
- ★ Numerous pathways to certification



Skills Gap

- ★ Need for continuous assessment
- ★ Need for personalized learning and adaptive training
- ★ Addressing evolving cyber threats

AI-Powered Adaptive Learning Value Proposition



Personalized Learning Pathways

Individualized learning pathways to meet foundational certification requirements



Smart Skill Gap Identification

Competency assessment identifies specific knowledge and skill gaps for rapid improvement



Accelerated Competency Building

AI-curated learning support optimizes learning, and reduces study time to improve certification pass rates and job readiness

AI Student Capabilities & Benefits

Grounded

Attribution to source material

- ★ Provides in-text citations and references
- ★ Ensures veracity, reduces hallucinations

Socratic

Verification of Knowledge

- ★ Fosters higher order thinking
- ★ Supports application of knowledge

Dynamic

Multimedia RAG Chat

- ★ Interface with multimodal content
- ★ Evolve to address emerging domains

Adaptive

Offers learning tools

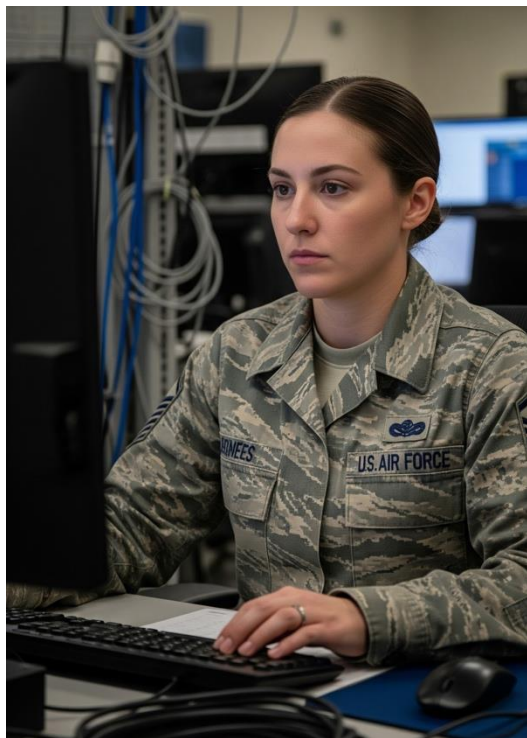
- ★ Personalized learning pathways
- ★ Individualized assessment creation



02

AI Student: A use case

AI Student Supporting Career Progression

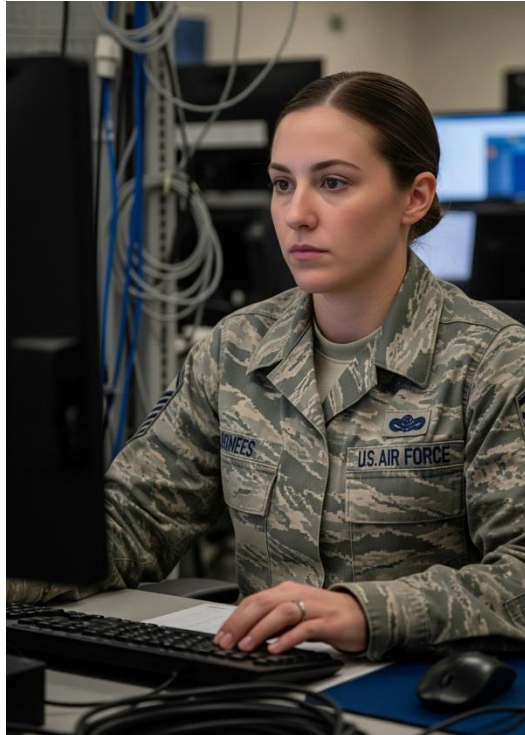


Senior Airman Santos

- ★ Associate's degree in Cybersecurity
- ★ Technical Support Specialist, Beginner's Proficiency
- ★ Holds CompTIA A+, CompTIA Network+ certifications
- ★ Seeking career progression through CompTIA Security+ certification

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Senior Airman Santos



I need a study plan for CompTIA Security+ that...

- ★ Incorporates my current level of expertise
- ★ Adheres to my desired timeline and commitments
- ★ Addresses my preferred learning style
- ★ Incorporates the resources I have access to

AGENT

AI Student: Cyber ▾



I am AI Student: Cyber, capable of leveraging multiple specialized AI tools to assist with a wide range of tasks to support cyber warrior training. I can discuss training content, generate study artifacts, and assess knowledge across the cyber domain.

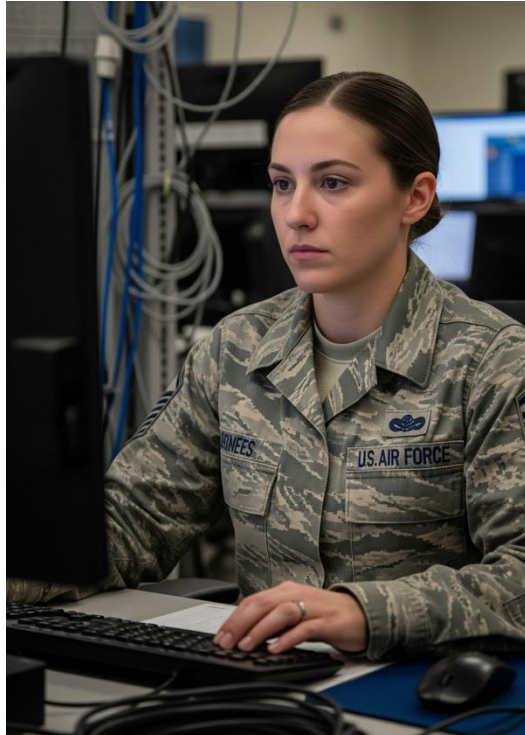
Type your message...



Socratic Discussion



Senior Airman Santos



I need clarification on a specific topic from my studies that...

- ★ Is targeted towards the CompTIA Security+ Exam
- ★ Is tailored to my level of proficiency in the topic
- ★ Is relevant to my current role and future aspirations
- ★ Is directly attributable to source material



AI Student: Cyber ▾

Agents

Audio Files

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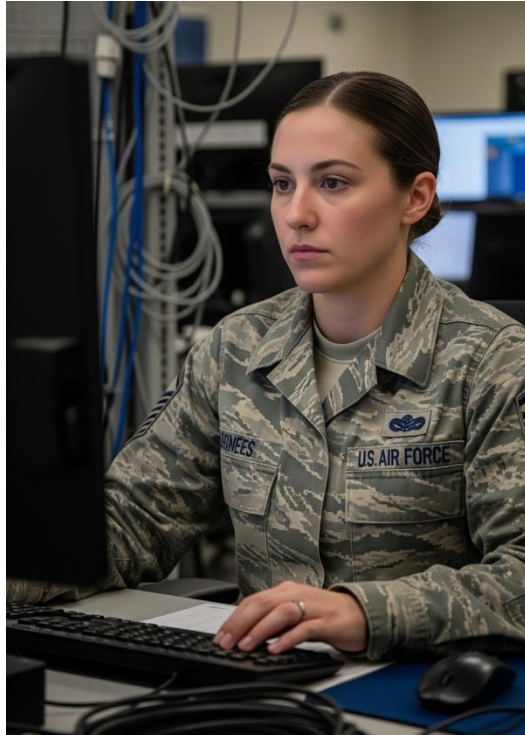
Type your message...



Socratic Discussion



Senior Airman Santos



I would like to further engage with a topic from my studies to...

- ★ Build a deeper understanding of the topic
- ★ Better understand its relationship to other topics
- ★ Apply principles in an engaging scenario

AI Student: Cyber ▾

Agents

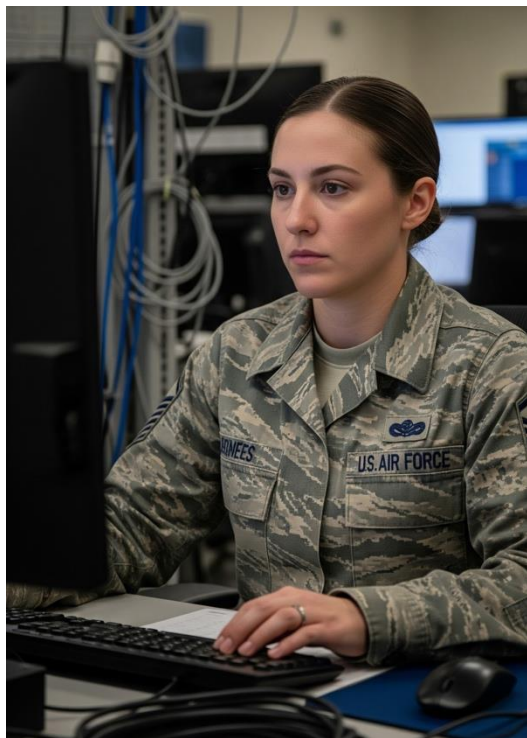
Audio Files

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Type your message...

 Socratic Discussion

Senior Airman Santos



I have additional learning material and want to...

- ★ Revisit content from a study session
- ★ Forge connections between readings and discussions
- ★ Stay up to date with emerging threat intelligence

AI Student: Cyber ▾

Agents

Audio Files

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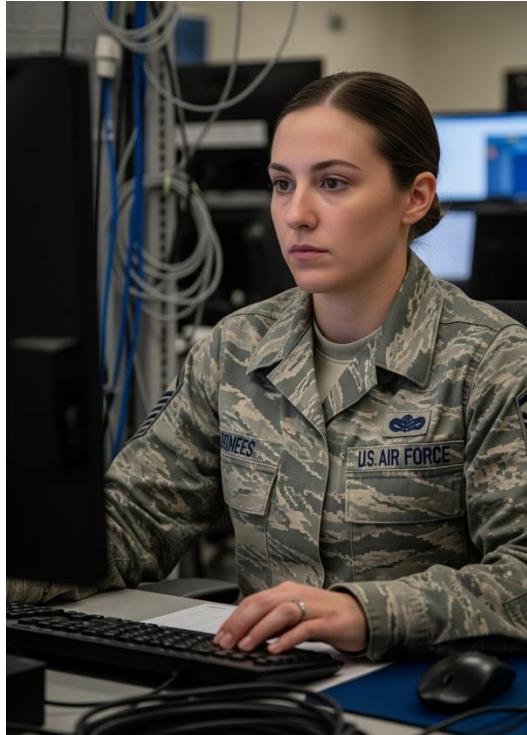
Type your message...



Socratic Discussion



Senior Airman Santos



I want to assess my current understanding in a way that....

- ★ Targets specific CompTIA Security+ content
- ★ Adapts to my level of proficiency
- ★ Provides meaningful and actionable feedback
- ★ Is directly attributable to source material

AGENT

AI Student: Cyber ▾

Agents

Audio Files

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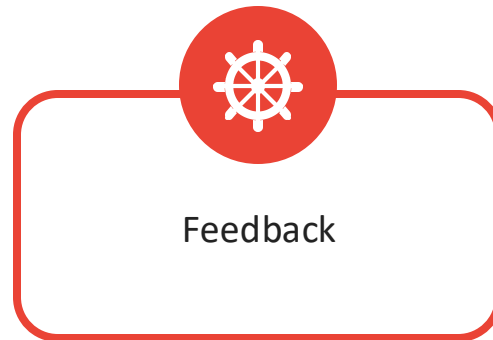
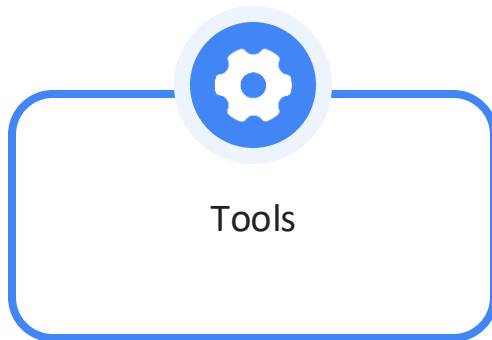
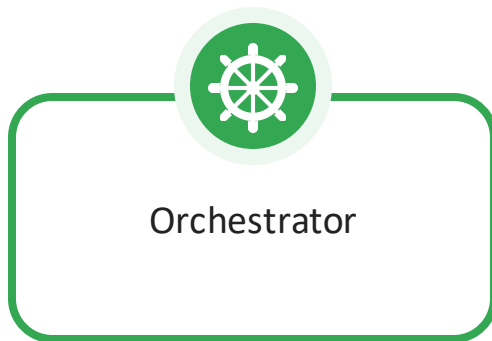
Type your message...

 Socratic Discussion

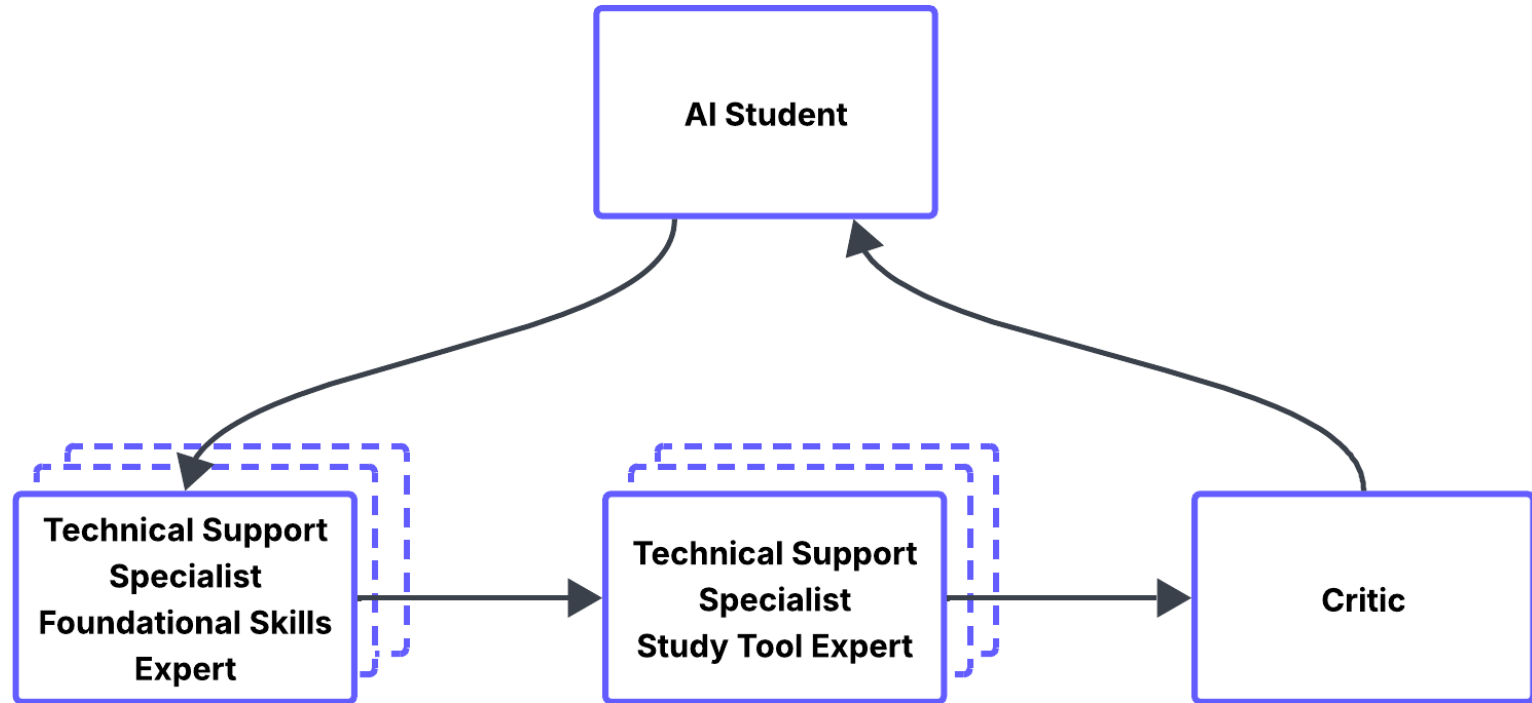


AI Student: Under the Hood

Multi-Agent Components



Simplified Architecture



Actor - Critic Iterative Feedback

Basics

Actor provides an answer, Critic provides feedback on the answer. The pair iteratively improves response until stopping condition is reached.

Multi Agent Deliberation

Multiple perspectives driving towards consensus generally results in increased quality and stability

Reinforcement Learning

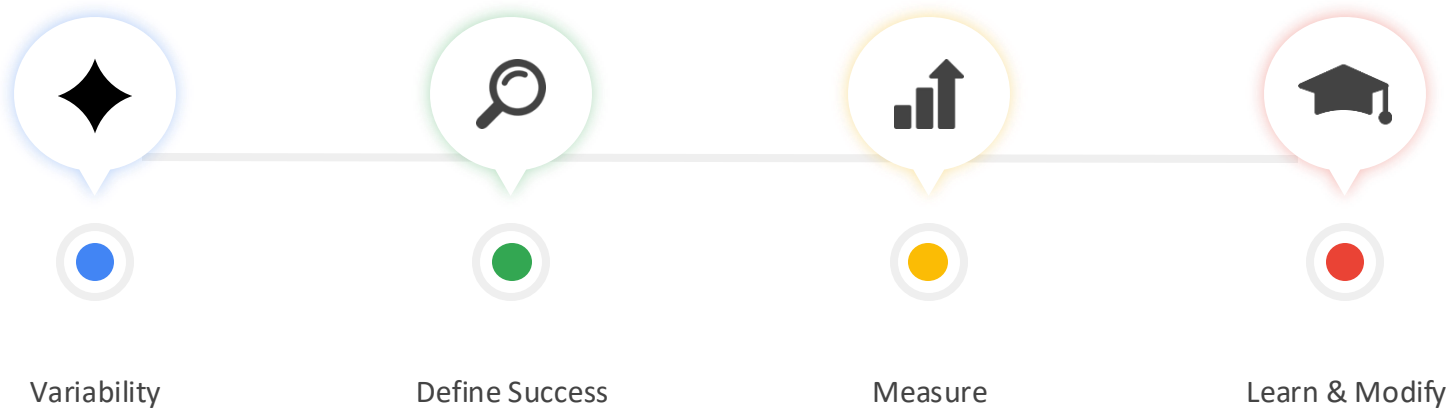
Objective scoring functions for each evaluation metric

Post Training

Scoring functions provide targeted metrics for use in post-training models for improved performance and efficiency

What We Learned

Evaluation Driven Development



Evaluation Driven Development **Grounding Improvements**



Robust Experimentation

Experimentation will include hyperparameter tuning across parsing, chunking, retrieval, and re ranking of both vector-based and graph-based RAG approaches.



Empirical Results

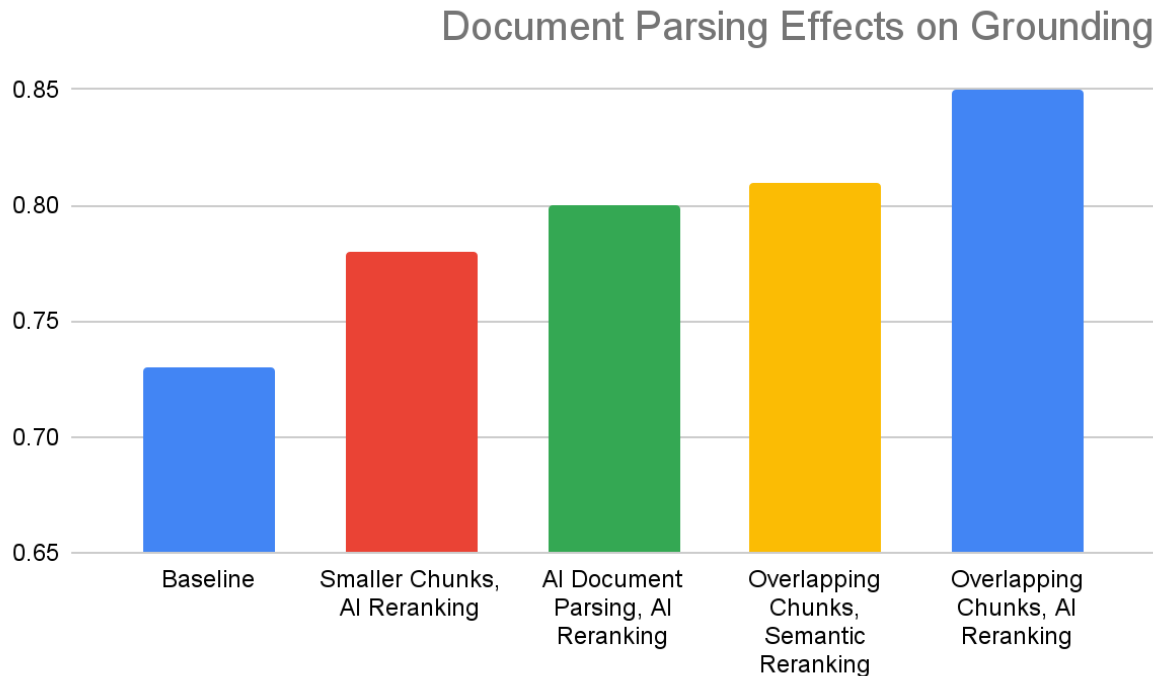
Each parameter configuration will be evaluated via model-based scoring of grounding support and helpfulness. These metrics provide insight to improve both response grounding and overall response quality.



Improved Response Quality

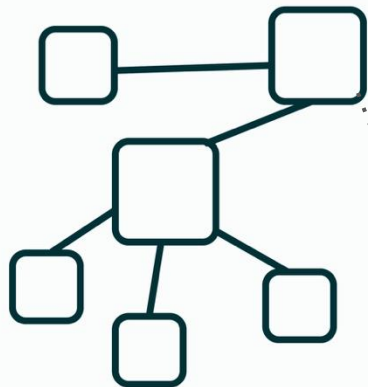
Improving the quality of our grounding ensures that users receive high-quality, verifiable responses across the AI Student system.

Evaluation Driven Development Example



Takeaway: Optimally preprocessing data improves model response quality. Structuring and formatting content before storing directly impacts the models ability to ground to retrieved context.

Agent Observability



Agent Details

```

{
  "text": "[staff_study_content_rubric] said: Excellent. I will now provide a comprehensive, rubric",
  "role": "user"
}
{
  "parts": [
    {
      "text": "For context:"
    },
    {
      "text": "[evaluator] said: The combined score from the evaluators is 38/54, which is a normalized",
      "role": "user"
    }
  ]
}

```

LLM Response Text:

Revise the staff study to address the following critical feedback. The paper must be fully compliant with Tongue & Quill standards.

1. **Correct the Citations and Formatting:**
 - Replace the current "References" list with a properly formatted "Endnotes" page at the end of the document. Provide full, correct citations for each source, not just filenames.
 - Ensure all in-text citation numbers are in superscript format (e.g., ¹).
2. **Refine the Core Staff Study Structure:**
 - In Section 2, "Factors Bearing on the Problem," add a mandatory subsection "C. Criteria". In this new subsection, define clear and measurable criteria that will be used to evaluate potential solutions (e.g., Survivability, Scalability, Lethality, Political Feasibility).
 - Completely restructure Section 3, "Discussion." You must systematically evaluate strengths of the three proposed solutions (Fortify Bases, Standoff Operations, ACE) against the specific criteria you established in Section 2.C. This will create a logical, evidence-based argument for your final recommendation.
3. **Expand and Deepen the Content:**
 - Significantly expand the paper to meet the 4-6 page length requirement. Add more detail, evidence, and analysis to the "Facts" and "Discussion" sections to create a comprehensive report, not just a summary.
 - In your analysis of the PRC's A2/AD threat, incorporate a discussion of non-kinetic threats. Explain how China's "system destruction warfare" doctrine integrates cyber, space, and electronic warfare to amplify the threat to U.S. operational systems.
 - When discussing the advantages and implementation of ACE, explicitly analyze the role of the intelligence enterprise. Describe the critical ISR capabilities required to support dispersed operations, such as identifying austere airfields and providing real-time threat data to deployed units.

LLM Usage Metadata:

```

{
  "candidates_token_count": 483,
  "candidates_tokens_details": {
    "modality": "TEXT",
    "token_count": 483,
    "prompt_tokens": 0
  }
}

```

Explainability and Accountability

- ★ Logs capture detailed inputs, internal reasoning, outputs, errors, and warnings to provide an audit trail of the system
- ★ Tracing follows user request through every intra-agent and inter-agent system timestep
- ★ Metrics capture and summarize model performance such as latency, token usage, and grounding

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Type your message...

 Socratic Discussion





AI Student: Future Work

Future Work

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Custom Resource Mapping

- ★ Map training material and SOPs to DoD 8140 qualification requirements
- ★ Blend component training resources with DoD materials for custom learning paths



Mastery Driven Analytics

- ★ Continuously assess individual learner progress against specific DoD 8140 KSATs
- ★ Forecast certification exam success probability and identify specific knowledge gaps



Cross Domain Scalability

- ★ Extend beyond DoD 8140 to support NICE Framework roles and emerging specializations
- ★ Identify transferable skills across cyber domains, enabling efficient career transitions



Unified Learning Platform

- ★ Construct broader application integration - the Duolingo of Cyber Workforce Training
- ★ Administrative access provides insights to organizational utilization and training metrics

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Proprietary & Confidential

Frequently Asked Questions

How do you reduce hallucinations?



Responses are grounded in retrieved context from source material with in-text citations and references. Additionally, an iterative feedback process ensures all claims are referenced.

Is this product currently in use?



We have developed a prototype of AI Student to support learners at Air Command and Staff College

What is the impact level of this system?



We currently operate as IL2, but can accommodate up to IL5 as needed.

How can I try this out?



Reach out Bo Bergstrom, AI Delivery Strategist, at bo@gameplan.tech