# Shannon Control Unit (SCU) 15% Training Efficiency Through Control Theory

## Patent Pending | Bell Labs Heritage

## **The Problem**

LLM training wastes billions on hyperparameter sweeps and unstable dynamics. Manual  $\lambda$  tuning is guesswork that costs months and millions. Current approaches treat training as an open-loop process with no feedback control.

#### The Solution

- Bounded PI controller maintains optimal information ratio S\* automatically
- Eliminates manual hyperparameter search entirely
- First stable application of control theory to deep learning

## **Proven Results (Llama 3.2-1B)**

Metric	Baseline	scu	Improvement
Perplexity	15.14	12.78	-15.6%
ВРТ	3.920	3.676	-6.2%
Manual Tuning	Required	Eliminated	100% automated

## **Technical Innovation**

- MDL-motivated information budget: S = ParamBPT/(DataBPT+ParamBPT)
- Real-time PI control:  $\lambda \leftarrow \lambda \cdot exp(-(K_{D} \cdot error + K_{i} \cdot ferror))$
- Maintains S at 1.0% ± 0.2pp throughout training

#### Scale & Validation

- Proven: Llama 3.2-1B with 15.6% perplexity improvement
- Validating: 3B model experiments ongoing
- Seeking partnership: Scale validation for 7B-70B+ models
- Platform: Works with any transformer architecture

**EXECUTE:** Economic Impact

For \$1B in annual training costs  $\rightarrow$  \$150M saved For \$100M training run  $\rightarrow$  \$15M saved

## Why Now?

- Training costs doubling every 6-10 months
- Compute is the bottleneck to AGI
- 15% efficiency = decisive competitive advantage

# Strategic Value for Partners

- "Powered by SCU" exclusive differentiator
- Immediate ROI on existing infrastructure
- No hardware changes required

The Offer: We're selecting one strategic GPU cloud partner for exclusive access. Partnership window closes Q1 2025.

## **Hunter Bown, Founder & CEO**

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10 min from CoreWeave Plano facility
shannonlabs.dev | github.com/Hmbown/shannon-control-unit

"My great-grandfather announced the transistor at Bell Labs in 1948. SCU brings the same magnitude of innovation to AI infrastructure."