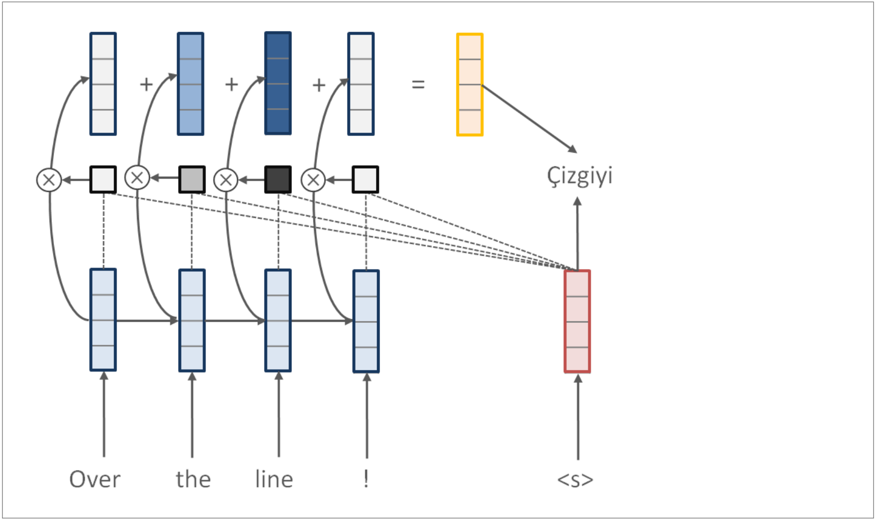
Challenges of Neural Document (Generation)

Alexander Rush [with Sam Wiseman and Stuart Shieber]

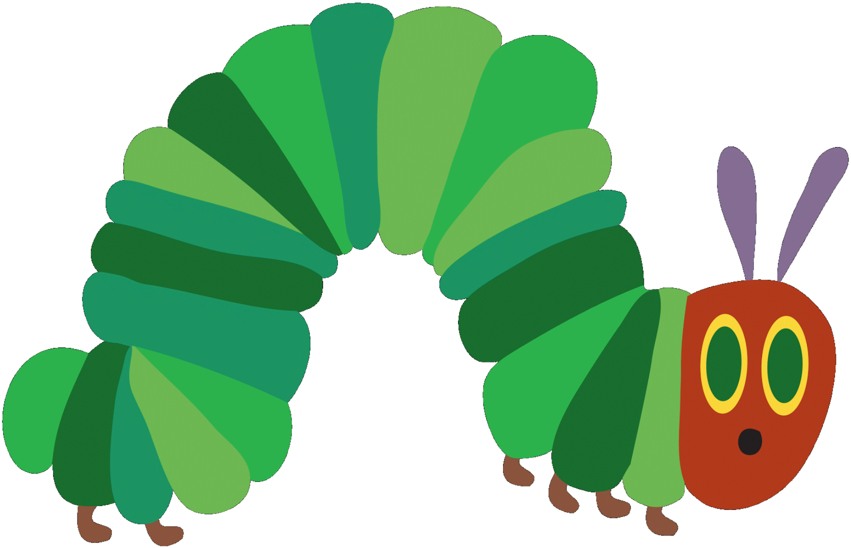
HarvardNLP

`lstm.seas.harvard.edu/docgen`

Mandatory NMT Slide



The Caterpillar

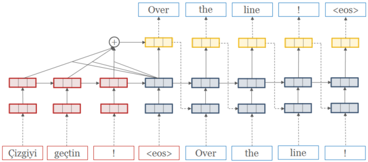


OpenNMT

An open-source neural machine translation system.

Home

OpenNMT is a industrial-strength, open-source (MIT) neural machine translation system utilizing the Torch/PyTorch mathematical toolkit.



OpenNMT is used as provided in production by major translation providers. The system is designed to be simple to use and easy to extend, while maintaining efficiency and state-of-the-art translation accuracy.

Towards Neural Document Generation

- Question 1: How well do advances in NMT transfer to NLG?
- Question 2: How can we quantify the issues in generation?
- Question 3: What high-level challenges are there remaining?

Caveat: Few answers in the talk

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TEAM	WIN	LOSS	PTS	FG_PCT	RB	AS ...
Heat	11	12	103	49	47	27
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PLAYER	AS	RB	PT	FG	FGA	CITY ...
Tyler Johnson	5	2	27	8	16	Miami
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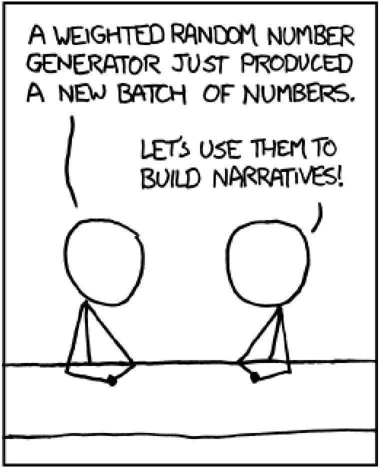
Dennis Schroder	7	4	17	8		
Rodney McGruder	5	5	11	3		
...						

The Atlanta Hawks defeated the Miami Heat, 103 - 95, at Philips Arena on Wednesday. Atlanta was in desperate need of a win and they were able to take care of a shorthanded Miami team here. Defense was key for the Hawks, as they held the Heat to 42 percent shooting and forced them to commit 16 turnovers. Atlanta also dominated in the paint, winning the rebounding battle, 47 - 34, and outscoring them in the paint 58 - 26. The Hawks shot 49 percent from the field and assisted on 27 of their 43 made baskets. This was a near wire-to-wire win for the Hawks, as Miami held just one lead in the first five minutes. Miami (7 - 15) are as beat-up as anyone right now and it's taking a toll on the heavily used starters. Hassan Whiteside really struggled in this game, as he amassed eight points, 12 rebounds and one blocks on 4 - of - 12 shooting ...



ALL SPORTS COMMENTARY

1. A Brief, Opinionated Tour of Natural Language Generation
2. A Case-Study in Neural Document Generation
   - Dataset, Models, Results
3. Results and Analysis
4. The Challenges of Neural Generation

Natural Language Generation (NLG)

Natural language generation is the process of deliberately constructing a natural language text in order to meet specified communicative goals. - MacDonald (1987)

Natural Language Generation: Historical Roots

- *Discourse Production* Davey (1978).

X	X	O
		O
X	O	O

If you had blocked my line, you would have threatened me, but you took the corner adjacent to the one which you took first and so I won by completing my line.

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Natural Language Generation: Historical Roots

- *PHRED and PHRAN* Wilensky (1982), Jacobs (1984).

Input: john graduated college. john looked for a job. the xenon corporation gave john a job. john was well liked by the xenon corporation. john was promoted to an important position by the xenon corporation. john got into an argument with john's boss. john's boss gave john's job to john's assistant. john couldn't find a job. john couldn't make a payment on his car and had to give up his car. john also couldn't make a payment on his house, and had to sell his house, and move to a small apartment. john saw a hit and run accident. the man was hurt. john dialed 911- the man's life was saved. the man was extremely wealthy. and rewarded john with a million dollars. john was overjoyed. john bought a huge mansion and an expensive car, and lived happily ever after.

Summary : john worked for the xenon corporation. the xenon corporation fired john. john could not pay for his house and his car. john was broke. a man gave john some money.

Challenges of Traditional NLG: The Hierarchy

- *Building Natural Language Generation Systems* Reiter and Dale (1999)

Module	*Content task*	*Structure task*
Document planning	Content determination	Document structuring
Microplanning	Lexicalisation; Referring expression Generation	Aggregation
Realisation	Linguistic realisation	Structure realisation

Figure 3.1 Modules and tasks.

- **Content:** *What to say?*
- **Structure:** *How to say it?*

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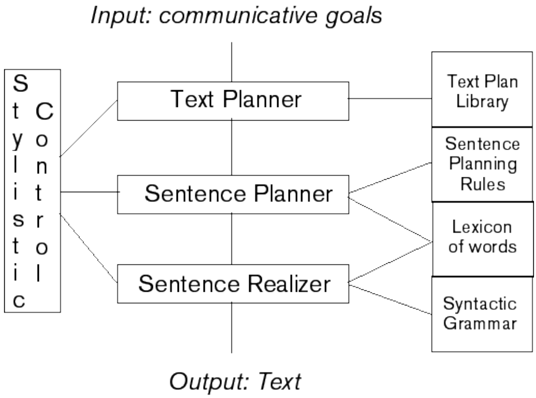
The Structure of NLG Systems

- From *Natural Language Generation* Hovy



Generation with Statistical Models: Examples

- *Headline generation based on statistical translation*, Banko et al (2000), also Knight and Marcu (2000)

Input: President Clinton met with his top Mideast advisers, including Secretary of State Madeleine Albright and U.S. peace envoy Dennis Ross, in preparation for a session with Israel Prime Minister Benjamin Netanyahu tomorrow. Palestinian leader Yasser Arafat is to meet with Clinton later this week. Published reports in Israel say Netanyahu will warn Clinton that Israel cant withdraw from more than nine percent of the West Bank in its next scheduled pullback, although Clinton wants a 12-15 percent pullback.

Summary: clinton to meet netanyahu arafat

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Generation with Statistical Models: Examples

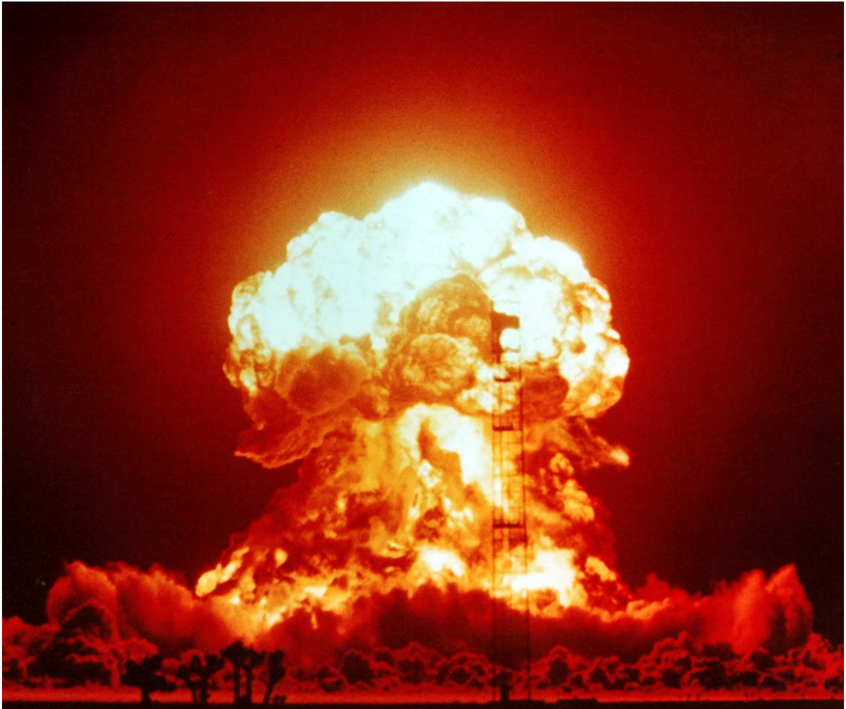
- *A simple domain-independent probabilistic approach to generation.*, Angeli et. al. (2010)

s:

```
temperature(time=5pm-6am,min=48,mean=53,max=61)
windSpeed(time=5pm-6am,min=3,mean=6,max=11,mode=0-10)
windDir(time=5pm-6am,mode=SSW)
gust(time=5pm-6am,min=0,mean=0,max=0)
skyCover(time=5pm-9pm,mode=0-25)
skyCover(time=2am-6am,mode=75-100)
precipPotential(time=5pm-6am,min=2,mean=14,max=20)
rainChance(time=5pm-6am,mode=someChance)
```

w: *a 20 percent chance of showers after midnight . increasing clouds , with a low around 48 southwest wind between 5 and 10 mph*

(b) WeatherGov



Generation and Summarization Post-NMT

- *Neural Abstractive Sentence Summarization* (Rush et al, 2015), (Chopra et al., 2016), also (Filipova et al, 2015)

Input (First Sentence)

Russian Defense Minister Ivanov called Sunday for the creation of a joint front for combating global terrorism.

Output (Title)

Russia calls for joint front against terrorism.

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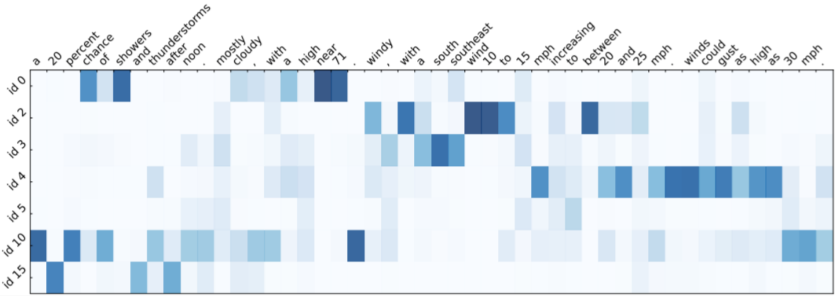
Generation and Sumarization Post-NMT

- *What to Talk About and How* (Mei et al, 2015) also *WikiBio* (Lebret et al, 2016)



Record details:
id-0: temperature(time=06-21, min=52, mean=63, max=71); id-2: windSpeed(time=06-21, min=8, mean=17, max=23);
id-3: windDir(time=06-21, mode=SSE); id-4: gust(time=06-21, min=0, mean=10, max=30);
id-5: skyCover(time=6-21, mode=50-75); id-10: precipChance(time=06-21, min=19, mean=32, max=73);
id-15: thunderChance(time=13-21, mode=SChc)

Figure 3: An example generation for a set of records from WEATHERGOV.

What helps beyond attention-based seq2seq?

Mostly model architectures (hacks?)

- Copy Attention / Pointer Networks
- Hard Attention Schemes
- Coverage Attention
- Hierarchal Attention
- Reconstruction Models
- Target Attention/Cache Models

Mini-industry of model extensions.

Progress in Neural Generation?

- Dozens of submissions to ACL this year on neural summarization and related tasks like simplification.
- ROUGE score results seem very high on some tasks, and keep improving

And yet, you have all seen system output...

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Case Study: Data-to-Document Generation

- Inspiration from: *Collective content selection for concept-to-text generation* (Barzilay and Lapata, 2005)

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	RoboCup	WeatherGov	RotoWire	SBNation
Vocab	409	394	11,331	68,574
Tokens	11K	0.9M	1.6M	8.8M
Examples	1,919	22,146	4,853	10,903
Avg Len	5.7	28.7	337.1	805.4
Field Types	4	10	39	39
Avg Records	2.2	191	628	628

Player Types								
POSN	MIN	PTS	FGM	FGA	FG-PCT	FG3M	FG3A	FG3-PCT
FTM	FTA	FT-PCT	OREB	DREB	REB	AST	TOV	STL
BLK	PF	NAME1	NAME2					
Team Types								
PTS-QTR1	PTS-QTR2	PTS-QTR3	PTS-QTR4	PTS	FG-PCT	FG3-PCT	FT-PCT	REB
AST	TOV	WINS	LOSSES	CITY	NAME			

Content Encoding with Cell Embeddings

- $\{r_1, \ldots, r_S\}$
- $r.t = \textsc{points}$, and such that entity $r.e =$ (Tyler Johnson) and value $r.m = 27$ (Liang et al, 2009)
- $\boldsymbol{s}_j = E(\boldsymbol{r}_j)$ for $j \in \{1, \ldots S\}$

PLAYER	AS	RB	PT	FG	FGA	CITY ...
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Paul Millsap	2	9	21	8	12	Atlanta
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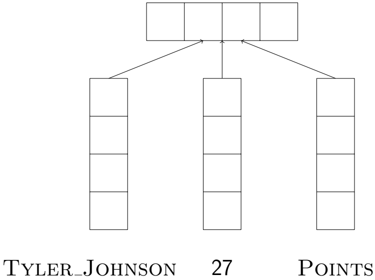
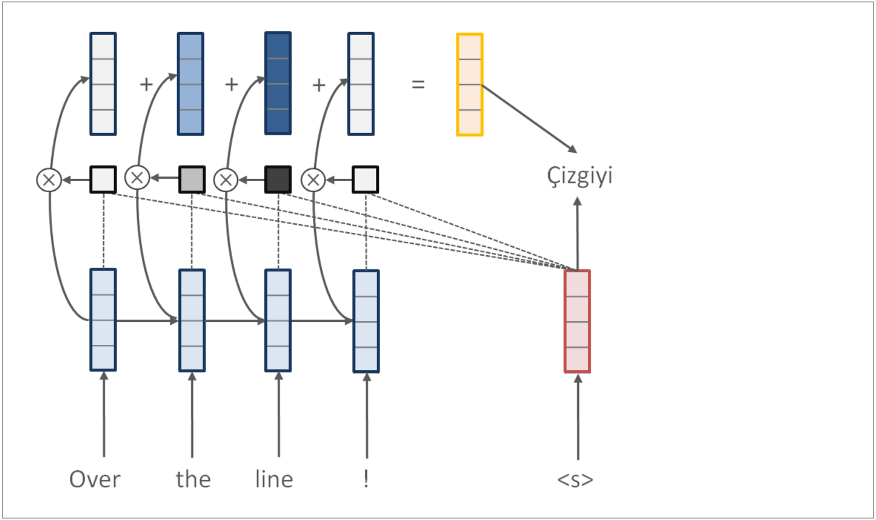


Question 1: How well do advances in NMT transfer to NLG?

Standard Attention-Based Decoder Network

- Generation done with Attention-based LSTM



Model Details

$s_1, \ldots, s_S$	Memory bank	Cell embeddings
$\mathbf{h_i}$	Query	Decoder hidden state
a	Memory selection	Cell position $\{1, \ldots, S\}$
$p(a = j \,\vert\, \mathbf{s}, \mathbf{h_i}; \theta)$	Attention distribution	$\mathrm{softmax}(s_j^\top h_i)$
$c = \mathbb{E}_a[s_a]$	Context Vector	

- LSTM decoder
- Train with 100-step truncated BPTT
- Cross-entropy objective with SGD

Trick 1: Source Copy

Joint Copy [Global Normalization] (Gu et al, 2016) among others

$$p(\hat{y}_t, z_t \mid \hat{y}_{1:t-1}, \boldsymbol{s}) \propto \begin{cases} \text{copy}(\hat{y}_t, \hat{y}_{1:t-1}, \boldsymbol{s}) & z_t,\, \hat{y}_t \in \boldsymbol{s} \\ 0 & z_t,\, \hat{y}_t \notin \boldsymbol{s} \\ \exp(g(\boldsymbol{h}_{t-1}, \tilde{\boldsymbol{s}}))_{\hat{y}_t} & z_t = 0 \end{cases}$$

Conditional Copy [Switch Variable z] (Gulcehre et al, 2017)

$$p(\hat{y}_t, z_t \mid \hat{y}_{1:t-1}, \boldsymbol{s}) = \begin{cases} p_{\text{copy}}(\hat{y}_t \mid z_t, \hat{y}_{1:t-1}, \boldsymbol{s}) \cdot p(z_t \mid \hat{y}_{1:t-1}, \boldsymbol{s}) & z_t = 1 \\ \text{softmax}(g(\boldsymbol{h}_{t-1}, \tilde{\boldsymbol{s}}))_{\hat{y}_t} \cdot p(z_t \mid \hat{y}_{1:t-1}, \boldsymbol{s}) & z_t = 0, \end{cases}$$

- Copy parameterized as a separate attention module.
- z parameterized as MLP over decoder.

Trick 2: Source Reconstruction

- Based on Tu et al (2017)
- Segment decoder hidden states into groups.
- Train the model to predict the source-based on these groups.
- Related to multitask-based approaches.
- Details in the paper.

Templated Baseline

The ⟨team1⟩ (⟨wins1⟩-⟨losses1⟩) defeated the ⟨team2⟩ (⟨wins2⟩-⟨losses2⟩) ⟨pts1⟩-⟨pts2⟩.

(6$\times$)

⟨player⟩ scored ⟨pts⟩ points (⟨fgm⟩- ⟨fga⟩ FG, ⟨tpm⟩-⟨tpa⟩ 3PT, ⟨ftm⟩- ⟨fta⟩ FT) to go with ⟨reb⟩ rebounds.

The ⟨team1⟩ next game will be at home against the Dallas Mavericks, while the ⟨team2⟩ will travel to play the Bulls.

		Development	
		PPL	BLEU
Beam	Model		
	Template	N/A	6.87
1	Joint Copy	7.46	10.41
	Joint Copy + Rec	7.25	10.00
	Joint Copy + Rec + TVD	7.22	12.78
	Conditional Copy	7.44	13.31
5	Joint Copy	7.46	10.23
	Joint Copy + Rec	7.25	10.85
	Joint Copy + Rec + TVD	7.22	12.04
	Conditional Copy	7.44	**14.46**

The Utah Jazz (38 - 26) defeated the Houston Rockets (38 - 26) 117 - 91 on Wednesday at Energy Solutions Arena in Salt Lake City . The Jazz got out to a quick start in this one , out - scoring the Rockets 31 - 15 in the first quarter alone . Along with the quick start , the Rockets were the superior shooters in this game , going 54 percent from the field and 43 percent from the three - point line , while the Jazz went 38 percent from the floor and a meager 19 percent from deep . The Rockets were able to out - rebound the Rockets 49 - 49 , giving them just enough of an advantage to secure the victory in front of their home crowd . The Jazz were led by the duo of Derrick Favors and James Harden . Favors went 2 - for - 6 from the field and 0 - for - 1 from the three - point line to score a game - high of 15 points , while also adding four rebounds and four assists ....

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:(

Generations are fluent and accurate...

- Along with the quick start , the Rockets were the superior shooters in this game , going 54 percent from the field and 43 percent from the three - point line

... but also complete and total junk

- The Rockets were able to out - rebound the Rockets (incorrect and terrible discourse!)
- The Jazz were led by the duo of Derrick Favors and James Harden (wrong team!)
- to score a game - high (not true!) of 15 points

An NLG-based Analysis

Goal: Attempt to better evaluate *What it said* and *How it said it*

What does this mean?

- Correct references in generation
- Clear referring expressions
- Coherent discourse structure
- Coverage of important content

Question 2: How can we quantify the issues in generation?

Criteria:

1. Relation Generation: Referring expressions should be easy trace.
2. Content Selection: Relevant content should be generated.
3. Content Ordering: Discourse structure should be consistent.

Observation: NLU is currently a lot easier than NLG.

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Extractive Evaluation

Use information extraction system for generations (details in paper)

Criteria:

1. Relation Generation: Referring expressions should be easy trace.
   - Precision and count of identified data points.
2. Content Selection: Relevant content should be generated.
   - F-score on generated data points.
3. Content Ordering: Discourse structure should be consistent.
   - Damerau-Levenshtein distance between ordered elements.

		Development				
		RG		CS		CO
Beam	Model	P%	#	P%	R%	DLD%
	Template	**99.35**	49.7	**45.17**	24.85	**12.2**
B=1	Joint Copy	47.55	7.53	20.53	22.49	8.28
	Joint Copy + Rec	57.81	8.31	23.65	23.30	9.02
	Joint Copy + Rec + TVD	60.69	8.95	23.63	24.10	8.84
	Conditional Copy	68.94	9.09	25.15	22.94	9.00
B=5	Joint Copy	47.00	10.67	16.52	26.08	7.28
	Joint Copy + Rec	62.11	10.90	21.36	26.26	9.07
	Joint Copy + Rec + TVD	57.51	11.41	18.28	25.27	8.05
	Conditional Copy	71.07	12.61	21.90	27.27	8.70

Human Evaluation

	# Supp.	# Cont.	Order Rat.
Gold	2.04	0.70	5.19
Joint Copy	1.65	2.31	3.90
Joint Copy + Rec	2.33	1.83	4.43
Joint Copy + Rec +TVD	2.43	1.16	4.18
Conditional Copy	3.05	1.48	4.03

Question 3: What high-level challenges are there remaining?

- Language model alone is not enough for long term references (noted in many other works , Lambada)
- Copy seems like a short-term fix, only handles simplistic realizations
- There is a surprising amount of algorithmic reasoning involved in data generation.

Also Perez-Beltrachini and Gardent (2017).

Project 1: Discourse and Reference in Generation

([The Atlanta Hawks] defeated [the Miami Heat], 103 - 95, at [Philips Arena] on Wednesday.)

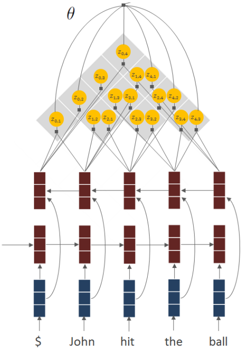
([Atlanta] was in desperate need of a win)

(and [they] were able to take care of a shorthanded [Miami] team here.)

(Defense was key for [the Hawks],)

(as they held [the Heat] to 42 percent shooting and forced them ...)

- *Structured Attention Networks*, Kim et al. (2017)



Project 2: Content Selection

PLAYER	AS	RB	PT	FG	FGA	CITY ...
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⋮						

Tyler Johnson led all Miami scorers with 27 points ...

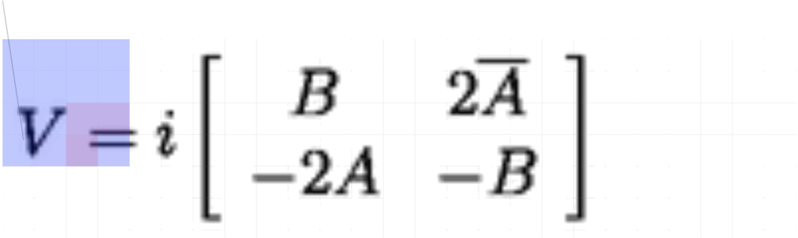
Dwight Howard recorded a triple-double on 9 of 11 shooting ...

Project 3: Multimodal Generation

Real text is not disembodied. ... As soon as we begin to consider the generation of text in context, we immediately have to countenance issues of **typography** *and* **orthography** *(for the written form) and* **prosody** *(for the spoken form). These questions can rarely be dealt with as afterthoughts. This is perhaps most obvious in the case of systems that generate both text and graphics and attempt to combine these in sensible ways.* - Dale et al.1998

Project 3: Multimodal Generation

- *Image-to-LaTeX* Deng et al (2017)



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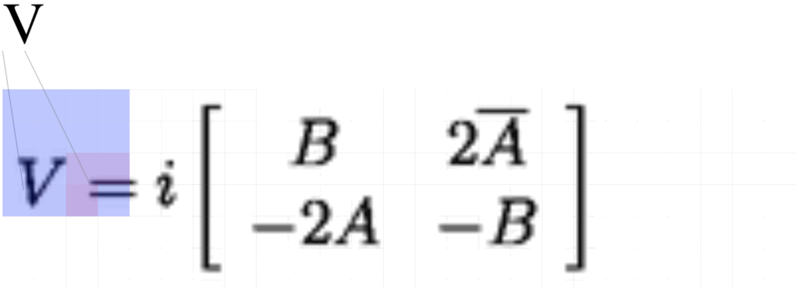

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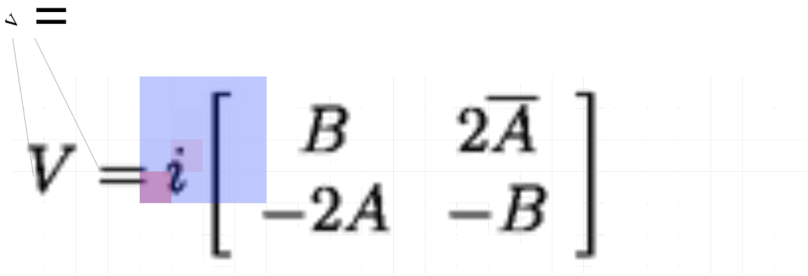

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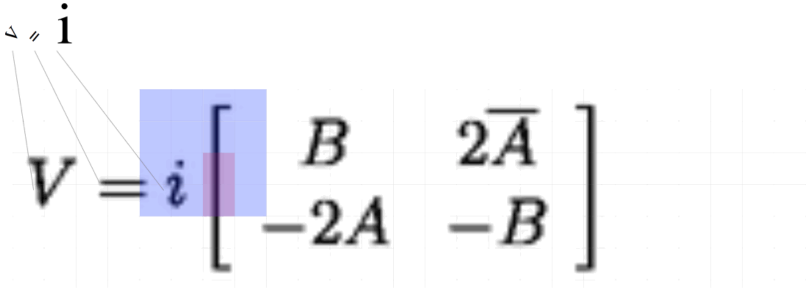

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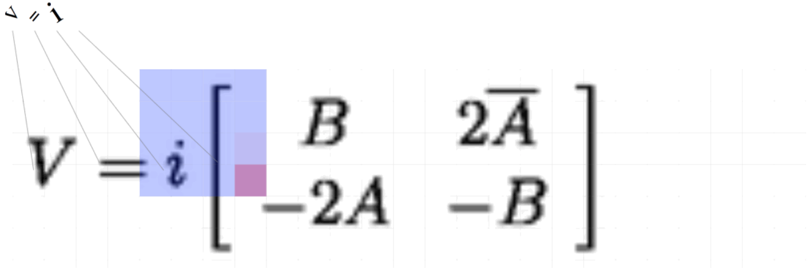

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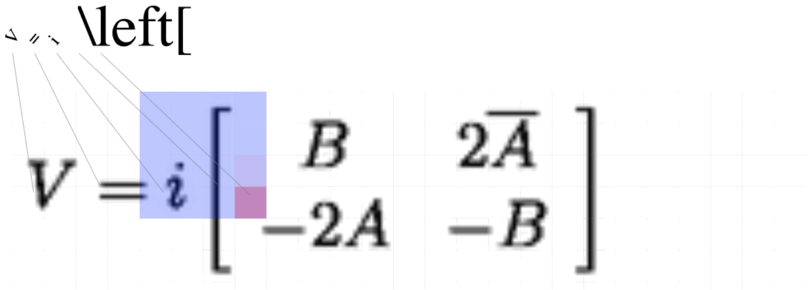

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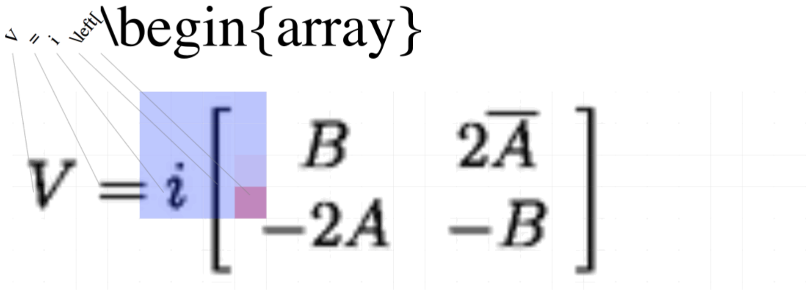

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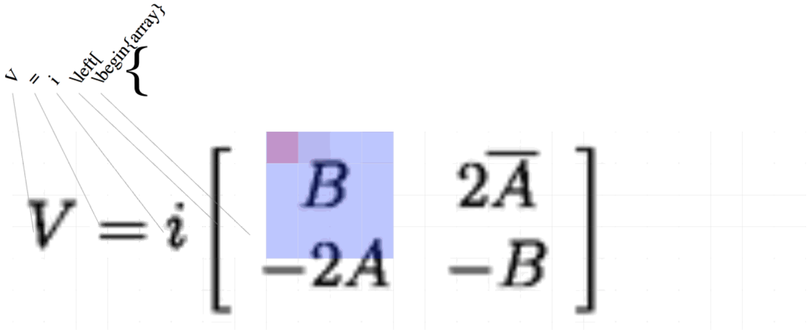

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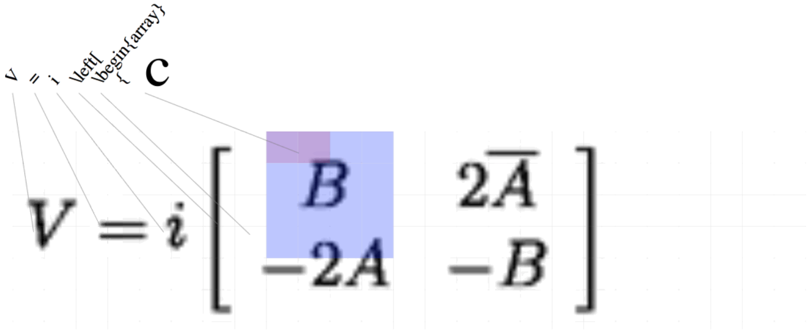

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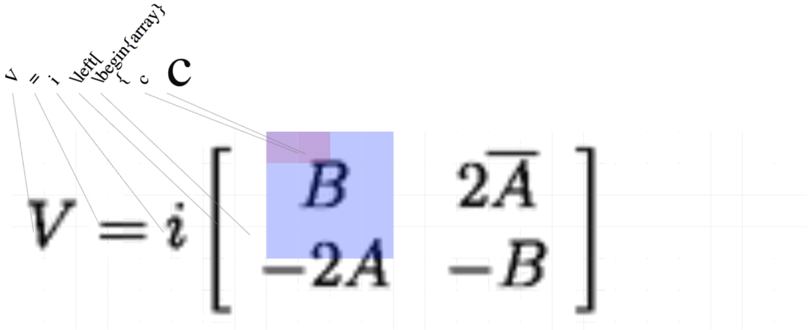

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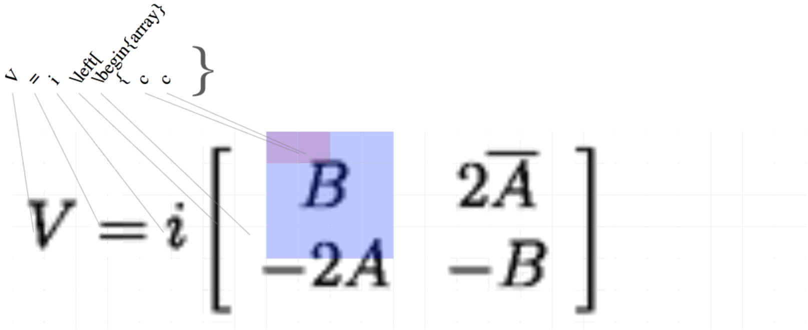

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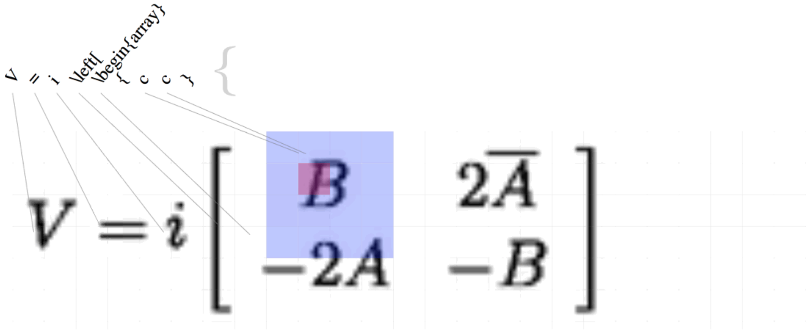

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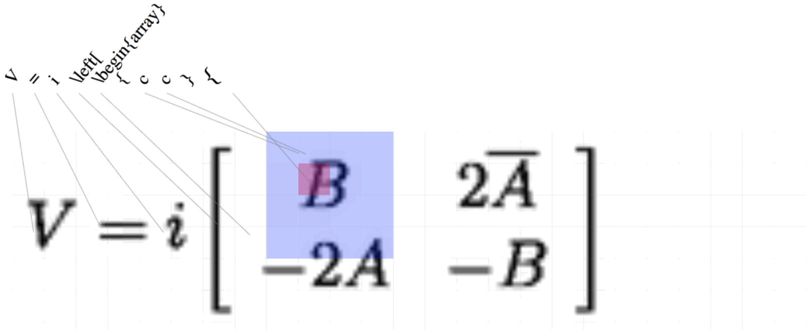

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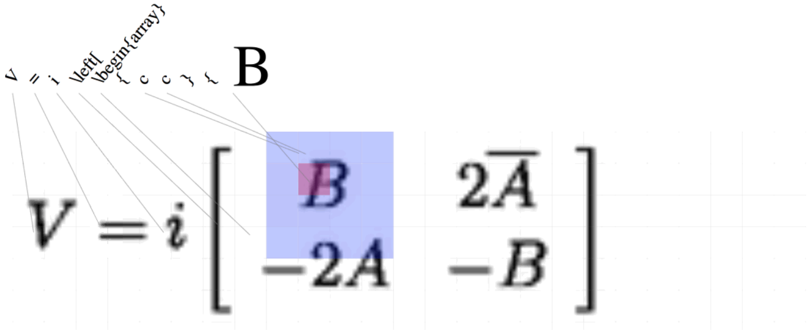

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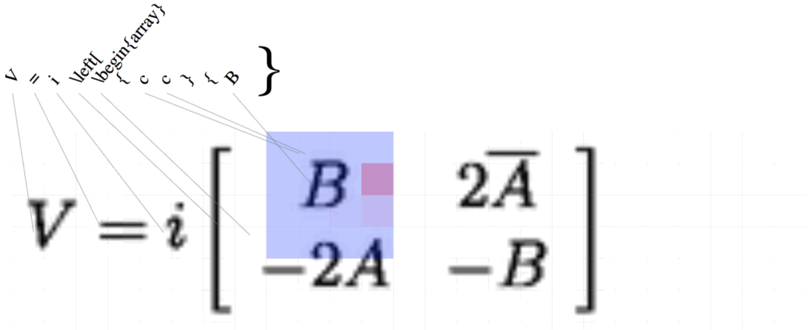

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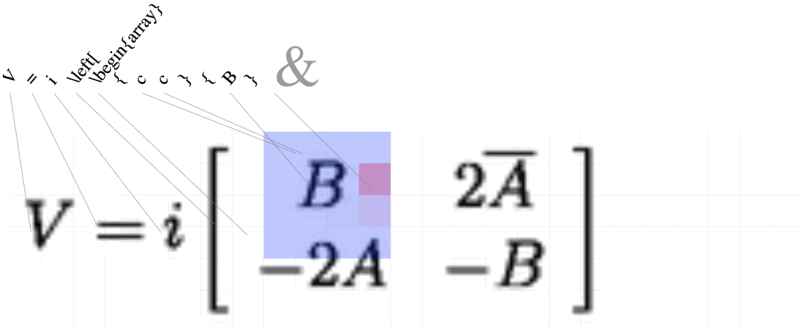

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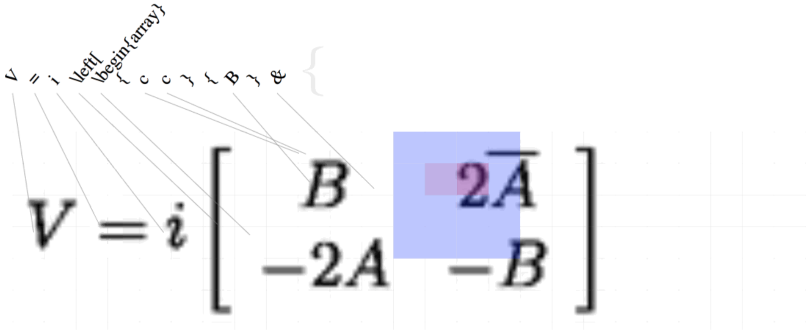

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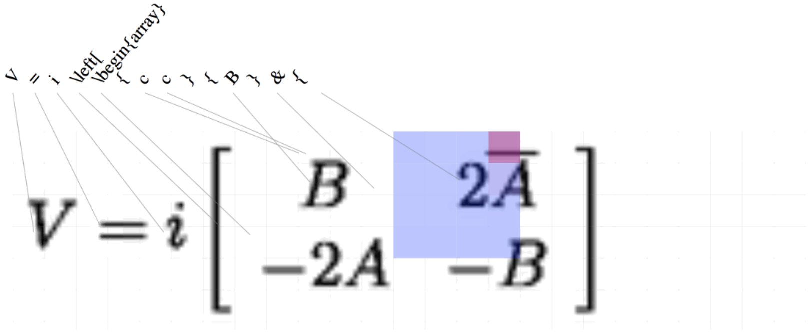

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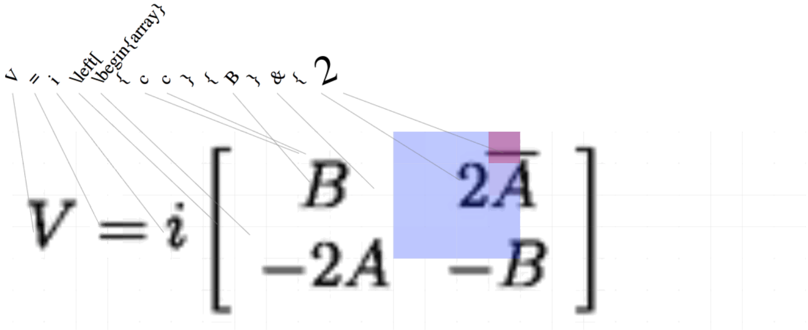

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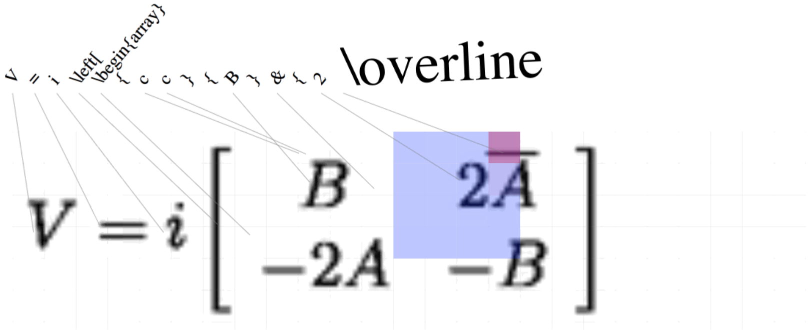

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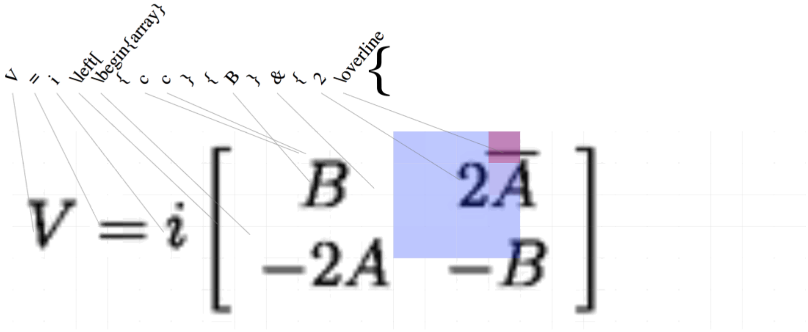

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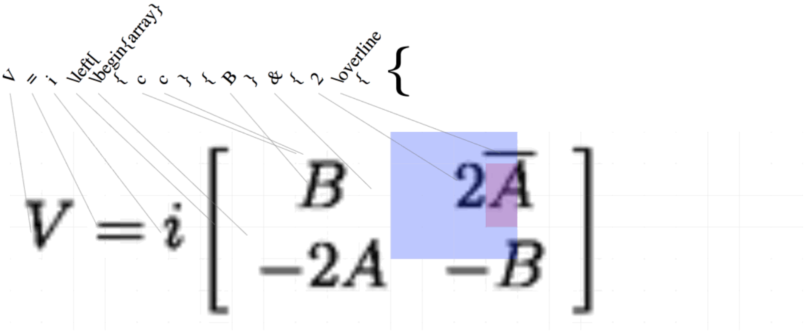

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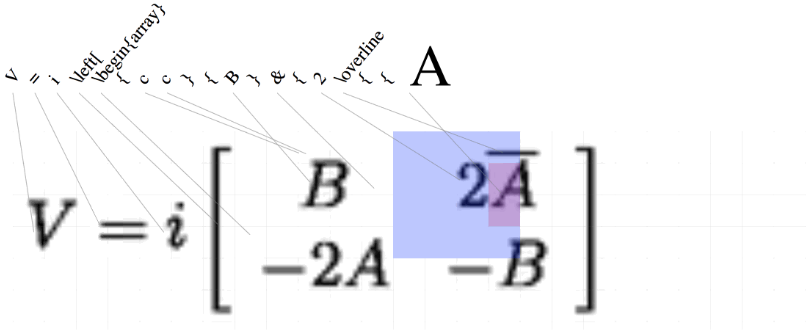

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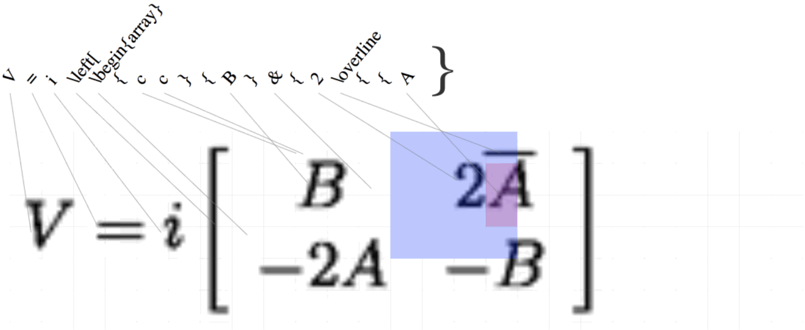

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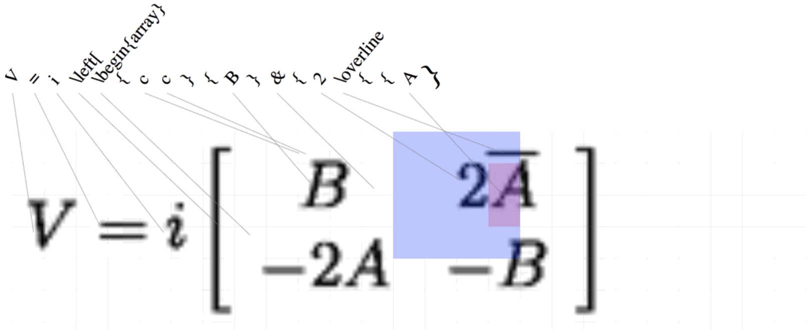

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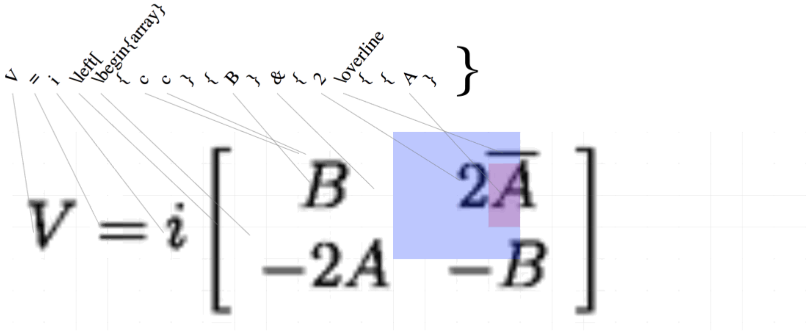

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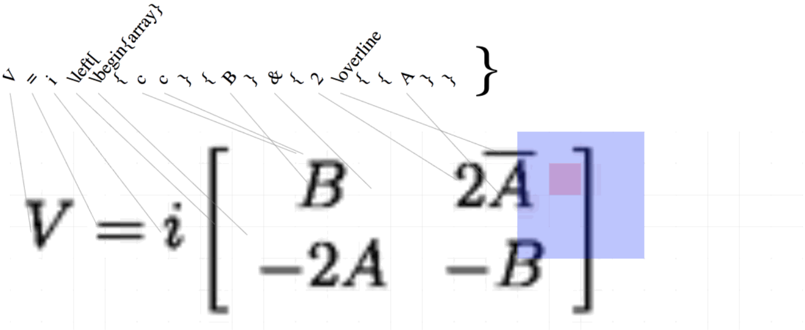

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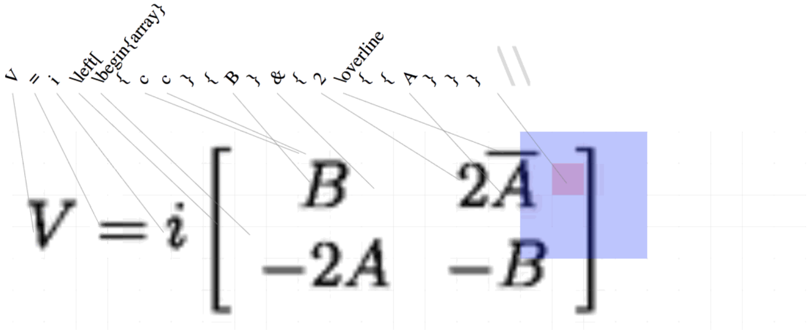

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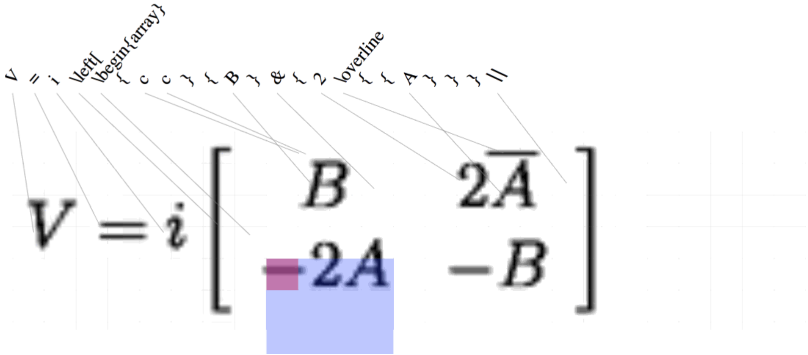

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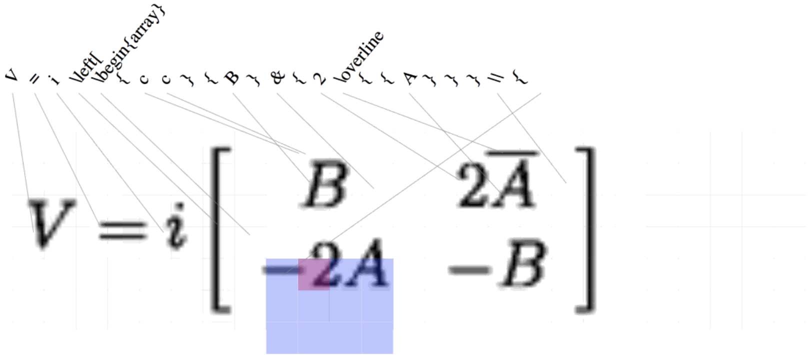

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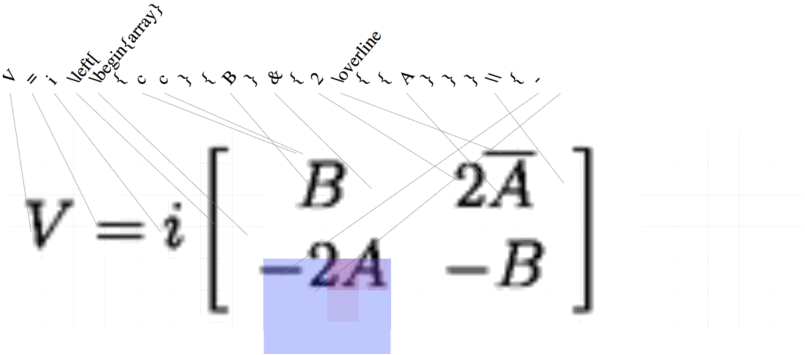

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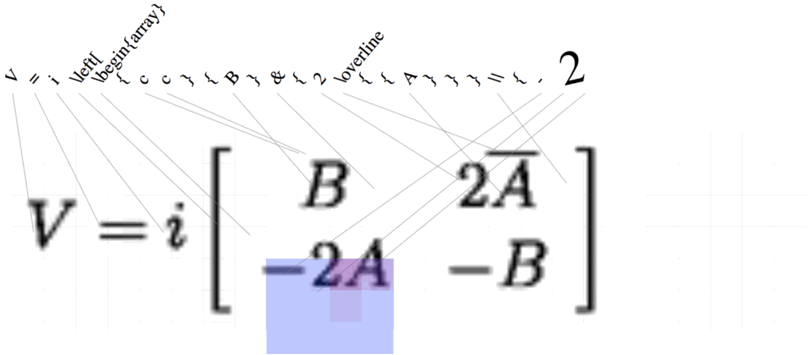

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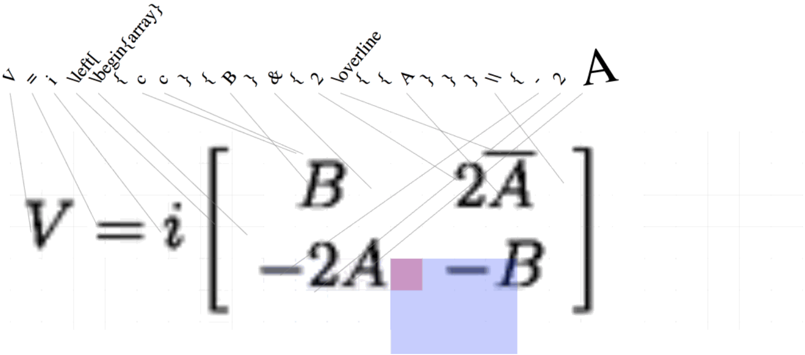

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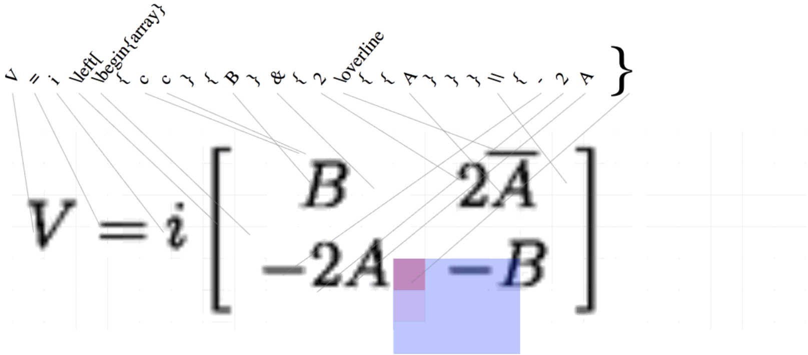

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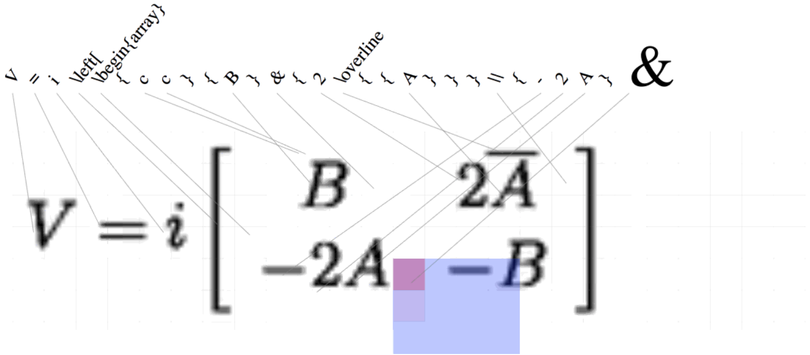

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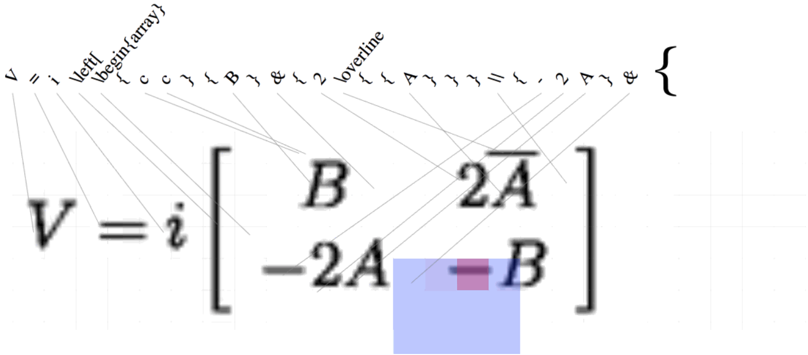

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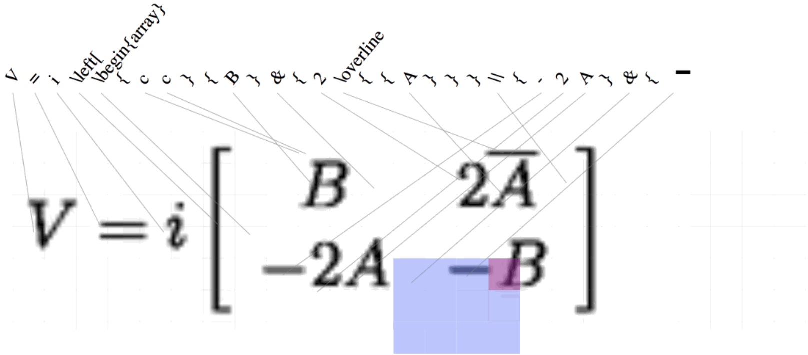

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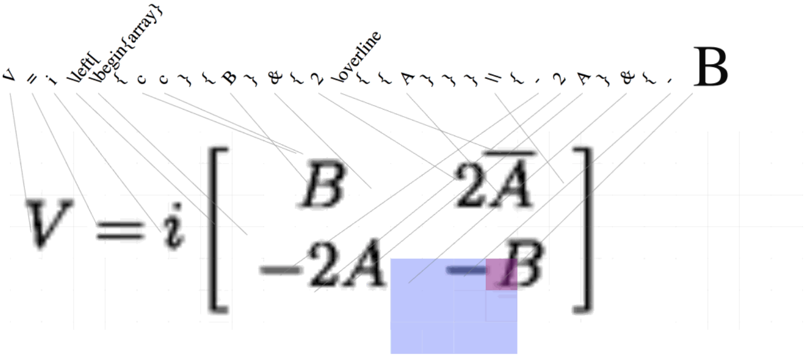

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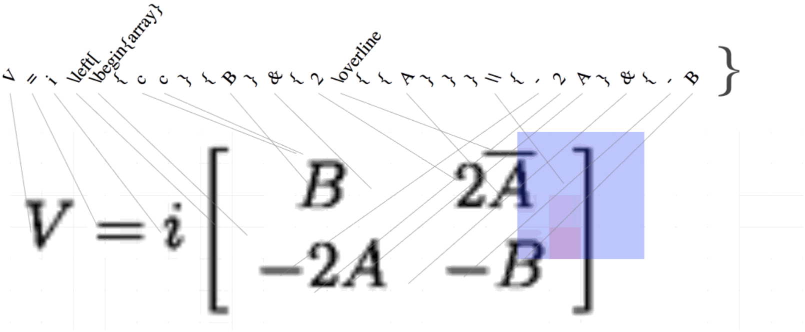

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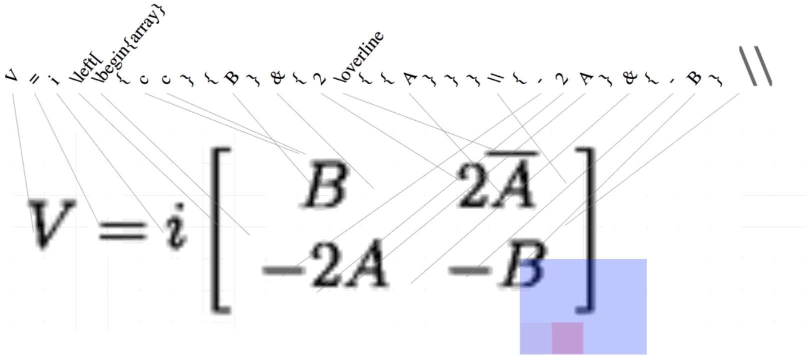

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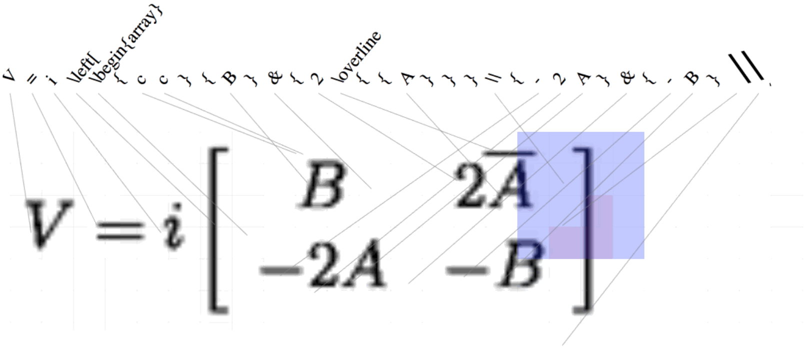

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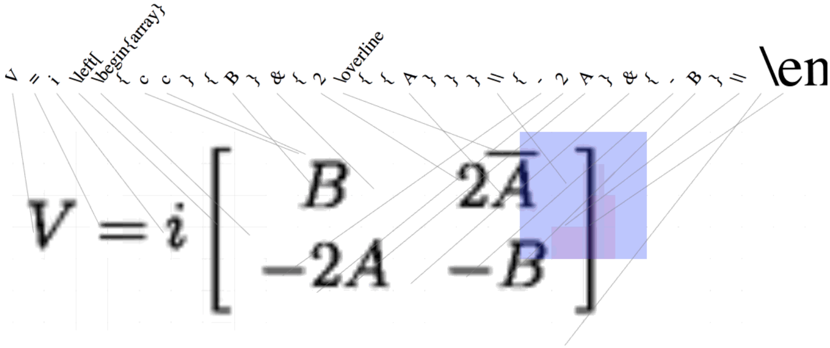

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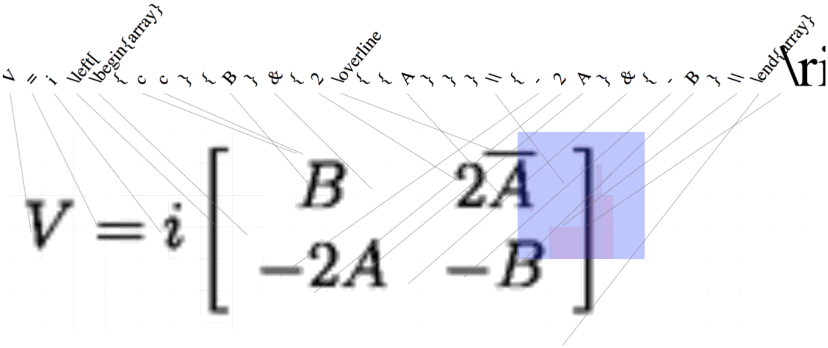

Project 3: Multimodal Generation

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$$A_0^3(\alpha' \rightarrow 0) = 2g_d\, \varepsilon^{(1)}_\lambda \varepsilon^{(2)}_\mu \varepsilon^{(3)}_\nu \left\{ \eta^{\lambda\mu}\left(p_1^\nu - p_2^\nu\right) + \eta^{\lambda\nu}\left(p_3^\mu - p_1^\mu\right) + \eta^{\mu\nu}\left(p_2^\lambda - p_3^\lambda\right) \right\} .$$

```
(A_{0}^{3}(\alpha^{\prime }\rightarrow 0)=2g_{d}\,\,\varepsilon^{(1)}_{\lambda}\varepsilon^{(2)}
_{\mu }\varepsilon^{(3)}_{\nu }\left\{ \eta ^{\lambda \mu}\left( p_{1}^{\nu }-p_{2}^{\nu }\right) +
\eta ^{\lambda \nu }\left(p_{3}^{\mu }-p_{1}^{\mu }\right)+\eta ^{\mu \nu }\left( p_{2}^{\lambda}
-p_{3}^{\lambda }\right) \right\} . \label{17}
```

$$\left\{\begin{array}{rcl}\delta_{\epsilon} B & \sim & \epsilon F\,, \\ \delta_{\epsilon} F & \sim & \partial\epsilon + \epsilon B\,, \end{array}\right.$$

```
\left\{\begin{array}{rcl}\delta_{\epsilon} B & \sim & \epsilon F
\, , \\\delta_{\epsilon} F & \sim & \partial\epsilon + \epsilon B
\, , \\\end{array}\right.
```

$$\int\limits_{\mathcal{L}^{d}_{d-1}} f(H)d\nu_{d-1}(H) = c_3 \int\limits_{\mathcal{L}^{A}_{2}} \int\limits_{\mathcal{L}^{L}_{d-1}} f(H)[H,A]^2 d\nu^{L}_{d-1}(H)d\nu^{A}_{2}(L).$$

```
\int \limits_{{\cal L}^{d}_{d-1}}f(H)d\nu_{d-1}(H) =  c_{3} \int \limits_{{\cal L}^{A}_{2}}
\int \limits_{{\cal L}^{L}_{d-1}}f(H)[H,A]^{2}d\nu_{d-1}^{L}(H)d\nu_{2}^{A}(L).
```

$$J = \left(\begin{array}{cc} \alpha^t & \tilde{f}_2 \\ f_1 & \tilde{A} \end{array} \right) \left(\begin{array}{ll} 0 & 0 \\ 0 & L \end{array} \right) \left(\begin{array}{cc} \alpha & \tilde{f}_1 \\ f_2 & A \end{array} \right) = \left(\begin{array}{ll} \tilde{f}_2 L f_2 & \tilde{f}_2 L A \\ \tilde{A} L f_2 & \tilde{A} L A \end{array} \right)$$

```
J=\left( \begin{array}{cc}\alpha ^{t} & \tilde{f}_{2} \\ f_{1} & \tilde{A}
\end{array}\right) \left( \begin{array}{ll}0 & 0 \\ 0 & L\end{array}\right)
\left( \begin{array}{cc}\alpha & \tilde{f}_{1} \\ f_{2} & A\end{array}\right) =
\left( \begin{array}{ll}\tilde{f}_{2}Lf_{2} & \tilde{f}_{2}LA \\ \tilde{A}Lf_{2} &
\tilde{A}LA\end{array}\right)
```

$$\lambda^{(2)}_{n,1} = \frac{\partial \overline{H}_0}{\partial q_{n,0}} \,, lambda^{(2)}_{n,j_n} = \frac{\partial \overline{H}_0}{\partial q_{n,j_n-1}} - \mu_{n,j_n-1} \,, \quad j_n = 2,3,\cdots,m_n - 1 \,.$$

```
\lambda_{n,1}^{(2)}=\frac{\partial\overline{H}_0}{\partial q_{n,0}}\ ,\ \\lambda_{n,j_n}^{(2)}=\frac{
\partial\overline{H}_0}{\partial q_{n,j_n-1}}-\mu_{n,j_n-1}\ ,\        \ j_n=2,3,\cdots,m_n-1\ .
```

$$(P_{ll'} - K_{ll'})\phi'(z_q)|\chi >= 0$$

```
(P_{ll'} - K_{ll'}) \phi '(z_{q})|\chi > = 0
```

Project 3: Multimodal Generation

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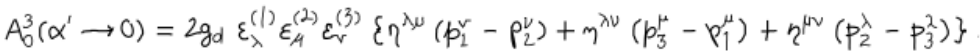

```
(A_{0}^{3}(\alpha^{\prime }\rightarrow 0)=2g_{d}\,\,\varepsilon^{(1)}_{\lambda}\varepsilon^{(2)}
_{\mu }\varepsilon^{(3)}_{\nu }\left\{ \eta ^{\lambda \mu}\left( p_{1}^{\nu }-p_{2}^{\nu }\right) +
\eta ^{\lambda \nu }\left(p_{3}^{\mu }-p_{1}^{\mu }\right)+\eta ^{\mu \nu }\left( p_{2}^{\lambda}
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```

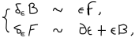

```
\left\{\begin{array}{rcl}\delta_{\epsilon} B & \sim & \epsilon F
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```
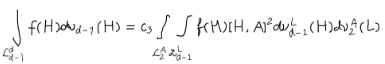
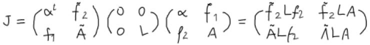
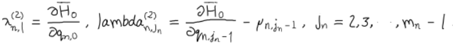



```
\int \limits_{{\cal L}^{d}_{d-1}}f(H)d\nu_{d-1}(H) =  c_{3} \int \limits_{{\cal L}^{A}_{2}}
\int \limits_{{\cal L}^{L}_{d-1}}f(H)[H,A]^{2}d\nu_{d-1}^{L}(H)d\nu_{2}^{A}(L).
```



```
J=\left( \begin{array}{cc}\alpha ^{t} & \tilde{f}_{2} \\ f_{1} & \tilde{A}
\end{array}\right) \left( \begin{array}{ll}0 & 0 \\ 0 & L\end{array}\right)
\left( \begin{array}{cc}\alpha & \tilde{f}_{1} \\ f_{2} & A\end{array}\right) =
\left( \begin{array}{ll}\tilde{f}_{2}Lf_{2} & \tilde{f}_{2}LA \\ \tilde{A}Lf_{2} &
\tilde{A}LA\end{array}\right)
```



```
\lambda_{n,1}^{(2)}=\frac{\partial\overline{H}_0}{\partial q_{n,0}}\ ,\ \\lambda_{n,j_n}^{(2)}=\frac{
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```

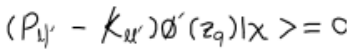

```
(P_{ll'} - K_{ll'}) \phi '(z_{q})|\chi > = 0
```

Longshot Project: Adversarial Regularized Autoencoder

in 1974 and the first nine of the seven years of nursing homes .

in 1974 and of the first five years of violence in the presidential campaign .

in 2008 at least five of the victims had been targeted .

it also predicted of potentially damaging the violence in the wake of the negotiatio

it also warned of not working against the collapse of the pakistani government .

not even president of washington accounts .

not even close to that of the experts say why .

not guilty of any ideas that is an option .

Thank You.

References I