Biometric Authorization for Building Security

Brian Murphy

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Overview

- Confidentiality of Building Access
- Solution
- Man vs. Machine
- Results
- Future work

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Who am I?

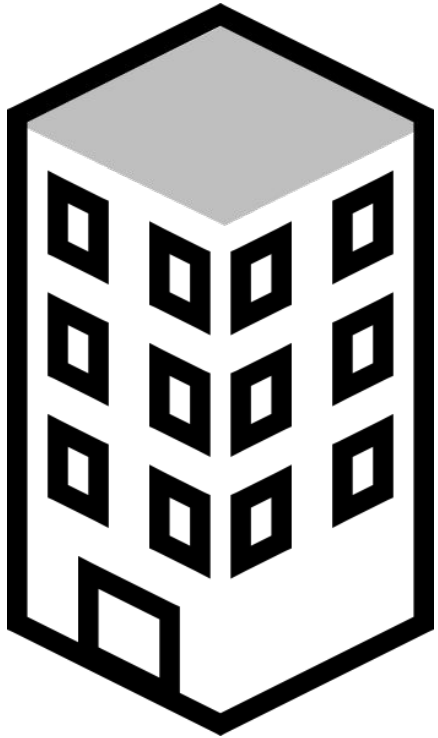
- Brian Murphy, Staff Analyst, NYC Gov
- 5 years of service
- Information Technology Officer for ACES
- Back-end Developer, tech enthusiast
- NYU MS in Cybersecurity Cyber Fellow
- LinkedIn: https://www.linkedin.com/in/brianmurphy94/

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

BM

Confidentiality of Building Access- Problem

- High attacker reward, high organization risk
- Common solutions have issues
  - Impersonation, broken scanners
  - Long
- Biometrics



linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Biometric and Alternative Solutions

- Voice Recognition
  - Many samples needed
  - High turnover orgs
  - Recording attacks
- Fingerprint Scanners
  - Gathering
  - Lines
- ECG Card
  - Gathering
  - Mentality dependent
- RFID Cards
  - Physical card, reproduction

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Gait Analysis and Recognition

- Gait is unique
- Questions:
  - Can models be accurate?
  - Are they better than humans?
- Hypothesis

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Can they be accurate?

- Short answer: yes
- Institute of Automation, Chinese Academy of Science CASIA sets
- Research
- CASIA-B
- Are they better than humans?

CASIA-B

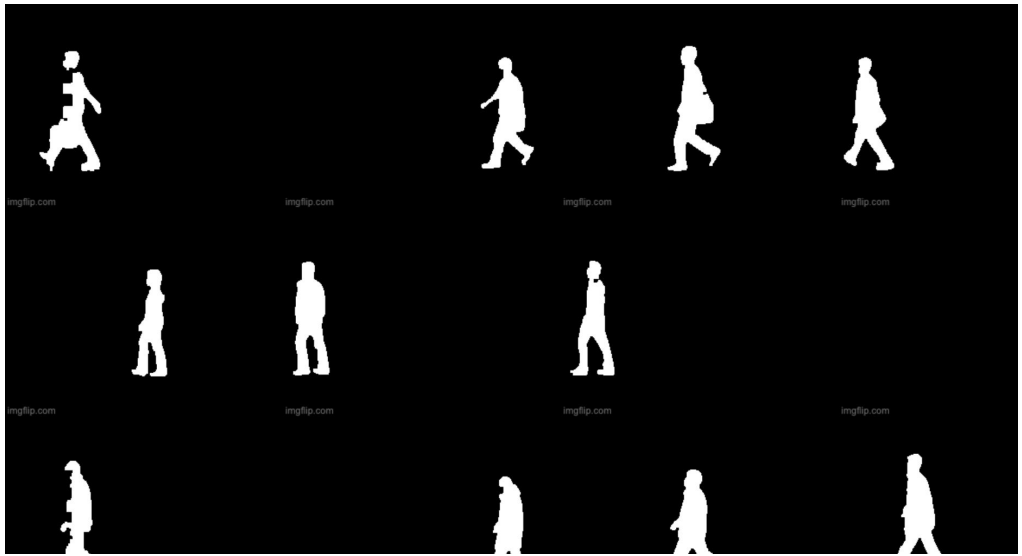
Model	NM	BG	CL	Configuration
Baseline	96.3	92.2	77.6	baseline.yaml
GaitSet(AAAI2019)	95.8(95.0)	90.0(87.2)	75.4(70.4)	gaitset.yaml
GaitPart(CVPR2020)	96.1(96.2)	90.7(91.5)	78.7(78.7)	gaitpart.yaml
GLN*(ECCV2020)	96.4(95.6)	93.1(92.0)	81.0(77.2)	gln_phase1.yaml, gln_phase2.yaml
GaitGL(ICCV2021)	97.4(97.4)	94.5(94.5)	83.8(83.6)	gaitgl.yaml

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Setup

- Subset of CASIA-B silhouettes
- Imgflip
- Experiment
  a. Show authorized persons
  b. Show random gifs
  c. Subjects identify
- Replit

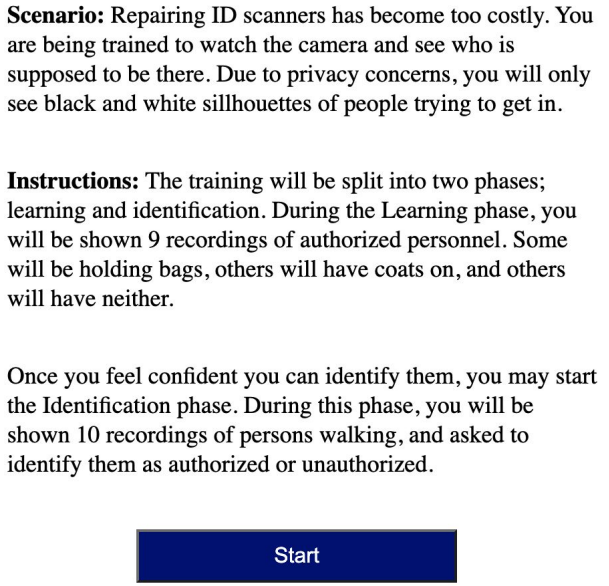


BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Implementation

- repl.it- FE and BE API
- HTML,CSS, JS to show gifs
  - Instructions

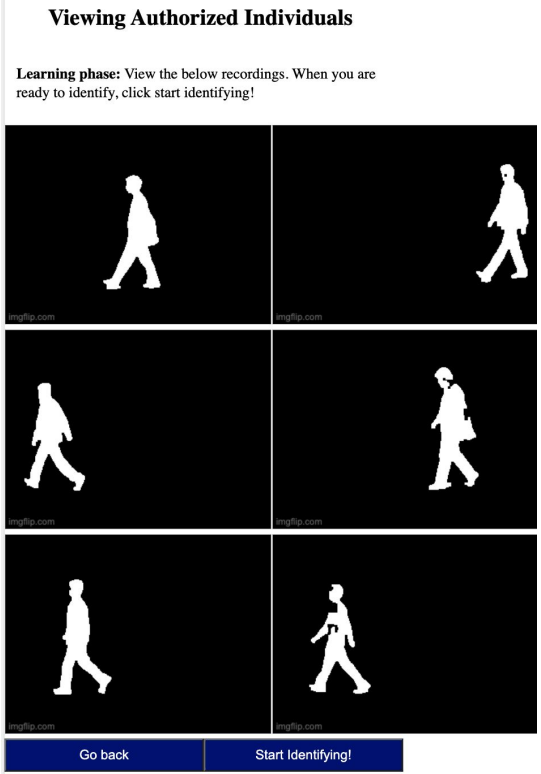


BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Implementation

- repl.it- FE and BE API
- HTML,CSS, JS to show gifs
  - Instructions
  - 6 or 9 authorized shown

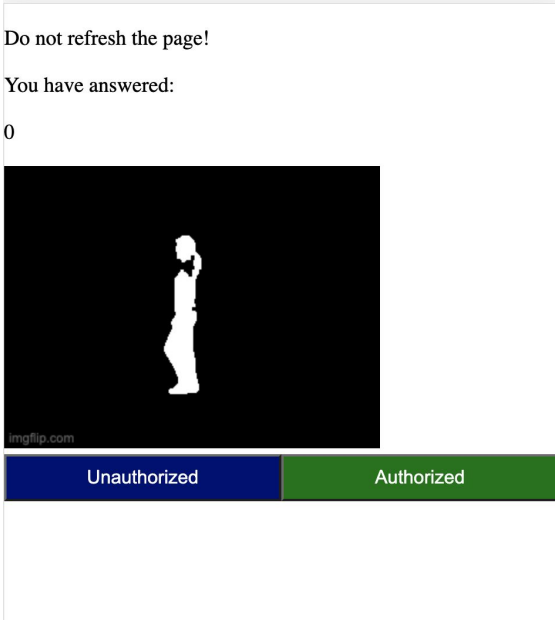


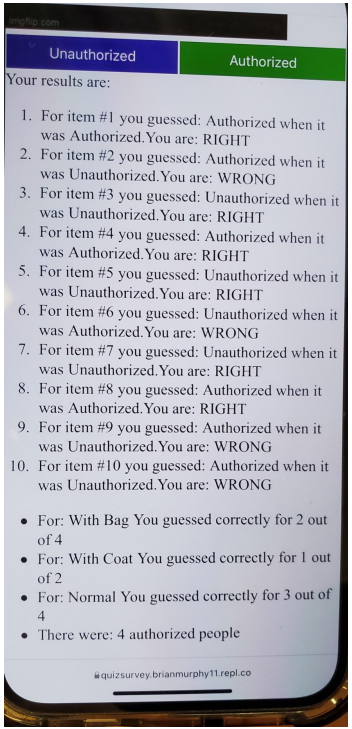
BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Implementation

- repl.it- FE and BE API
- HTML,CSS, JS to show gifs
  - Instructions
  - 6 or 9 authorized shown
  - Show gif, identify
  - Show results at the end
- Data pushed to a Flask API, also on repl.it





BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Results

Date	Time	Seed	SeqNum	Guess	Actual	Image	Type	Status
12/09/2021	7:35:15	24130207111810212017	5571	0	0	images/15-cl1-90.gif	Coat	RIGHT
12/09/2021	7:35:15	24130207111810212017	5571	0	1	images/24-nm1-90.gif	Normal	WRONG
12/09/2021	7:35:15	24130207111810212017	5571	0	0	images/01-bg1-90.gif	Bag	RIGHT
12/09/2021	7:35:15	24130207111810212017	5571	0	0	images/09-cl1-90.gif	Coat	RIGHT
12/09/2021	7:35:15	24130207111810212017	5571	0	1	images/13-bg1-90.gif	Bag	WRONG
12/09/2021	7:35:15	24130207111810212017	5571	1	0	images/05-cl1-90.gif	Coat	WRONG
12/09/2021	7:35:15	24130207111810212017	5571	0	1	images/07-nm1-90.gif	Normal	WRONG
12/09/2021	7:36:20	05260117211316110306	6845	1	0	images/23-cl1-90.gif	Coat	WRONG

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Results

Results by type of gif

	Right		Wrong		Grand Total	
Type	Number	Percentage	Number	Percentage	Number	Percentage
Bag	26	28.89%	40	37.74%	66	33.67%
Coat	30	33.33%	24	22.64%	54	27.55%
Normal	34	37.78%	42	39.62%	76	38.78%
Total	**90**	**100.00%**	**106**	**100.00%**	**196**	**100.00%**

Results by end result

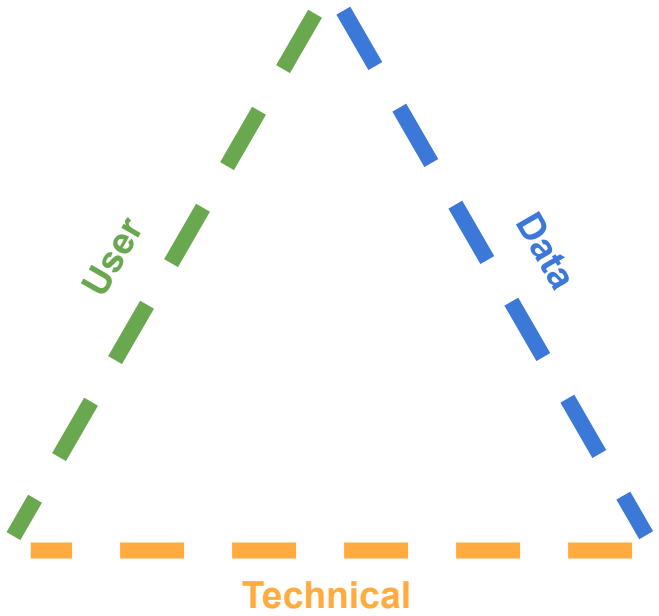
Status	Bag	Coat	Normal	Grand Total
RIGHT	39.39%	55.56%	44.74%	45.92%
WRONG	60.61%	44.44%	55.26%	54.08%
Grand Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Future Work

- Fixing issues
- Data Issues
  a. Similar, use different sets
  b. Could have tracked more
- Technical Issues
  a. Glitches
  b. Unable to test locally
  c. Replit sleep
- User Issues
  a. Too similar!
  b. Cheating
  c. Understanding and accessibility



linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Acknowledgements and References

1. [1] S. Mohamed and W. Martono, "Design of Fusion Classifiers for Voice-Based Access Control System of Building Security," 2009 WRI World Congress on Computer Science and Information Engineering, 2009, pp. 80-84, doi: 10.1109/CSIE.2009.983. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
2. [2] F. Zeng et al., "Biometric Electrocardiogram Card for Access Control System," 2011 Fifth International Conference on Genetic and Evolutionary Computing, 2011, pp. 373-376, doi: 10.1109/ICGEC.2011.92.
3. [3] R. T. Hans, "Using a biometric system to control access and exit of vehicles at Tshwane University of Technology," 2014 International Conference on Computer, Communications, and Control Technology (I4CT), 2014, pp. 230-233, doi: 10.1109/I4CT.2014.6914180.
4. [4] P. V. Bindu, K. D. Al-Hanawi, A. M. Al-Abri and V. Mahadevan, "IoT Based Safety System for School Children: A Contactless Access Control for Post Covid School Conveyance," 2021 2nd International Conference for Emerging Technology (INCET), 2021, pp. 1-4, doi: 10.1109/INCET51464.2021.9456314.
5. [5] H. Chao, K. Wang, Y. He, J. Zhang and J. Feng, "GaitSet: Cross-view Gait Recognition through Utilizing Gait as a Deep Set," in IEEE Transactions on Pattern Analysis and Machine Intelligence, doi: 10.1109/TPAMI.2021.3057879.
6. [6] C. Fan et al., "GaitPart: Temporal Part-Based Model for Gait Recognition," 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2020, pp. 14213-14221, doi: 10.1109/CVPR42600.2020.01423.

1. https://ieeexplore-ieee-org.proxy.library.nyu.edu/document/5170665
2. https://ieeexplore-ieee-org.proxy.library.nyu.edu/stamp/stamp.jsp?tp=&arnumber=6042804&isnumber=6042702
3. https://ieeexplore-ieee-org.proxy.library.nyu.edu/stamp/stamp.jsp?tp=&arnumber=6914180&isnumber=6914123
4. https://ieeexplore-ieee-org.proxy.library.nyu.edu/stamp/stamp.jsp?tp=&arnumber=9456314&isnumber=9456045
5. https://ieeexplore-ieee-org.proxy.library.nyu.edu/stamp/stamp.jsp?tp=&arnumber=9351667
6. https://ieeexplore-ieee-org.proxy.library.nyu.edu/stamp/stamp.jsp?tp=&arnumber=9156784

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

BM

Acknowledgements and References

- OpenGait Authors:
  - Chao Fan (樊超), 12131100@mail.sustech.edu.cn
  - Chuanfu Shen (沈川福), 11950016@mail.sustech.edu.cn
  - Junhao Liang (梁峻豪), 12132342@mail.sustech.edu.cn
- GLN: Saihui Hou (侯赛辉)
- GaitGL: Beibei Lin (林贝贝)
- https://github.com/ShiqiYu/OpenGait

- Slide Images:
  - https://cliparting.com/free-building-clipart-27363/
  - https://engineering.nyu.edu/academics/programs/master-science
  - https://github.com/ShiqiYu/OpenGait

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Acknowledgements and References

- NYU Tandon ISP Course Professors:
  - Paola Garcia, MS.
  - Brandon Sloane, MS.
  - Aspen Olmsted, Ph. D.
- ISP TA's
  - Roman Garber
  - Kiran Chaudhry
  - Alon Hillel-Tuch
  - Steven Angulo
  - Julio Nunez

BM

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu

Wrap Up

- Brian Murphy, Staff Analyst
- My LinkedIn: https://www.linkedin.com/in/brianmurphy94/
- GitHub Repo: https://github.com/bmurdata/ISP-Building-Security
- Write-up link:

Thank you for watching! Questions?

Email or comment

linkedin.com/in/brianmurphy94
bpm9231@nyu.edu