# Constantin N. Weisser

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## EDUCATION

**Massachusetts Institute of Technology** Sep 2015 - Apr 2021 | Cambridge, MA
*Ph.D. Physics, Statistics & Data Science*: Machine Learning in Particle Physics; GPA: 5.0/5
and search for hypothetical "Dark Photon" particles at CERN Advisor: Mike Williams

**University of Manchester** Sep 2011 - Jun 2015 | Manchester, UK
*Integrated Master of Physics [Undergraduate]*, Sustained Outstanding Performance Award (top 5%)

**University of California, Berkeley** Study Abroad Sep 2013 - Jun 2014 | Berkeley, CA

## TECHNICAL SKILLS

**Programming**: Python (pytorch, keras, tensorflow, scikit-learn, numpy), C++ (STL and ROOT) , R
**Machine Learning**: Linear regression, CART, SVM, Naive Bayes, kNN, CNNs, RNNs, LSTM, GRU, BERT, VAE, GAN, PCA, SGD, ADAM, ensemble algorithms, LASSO & ridge regularization
**Statistics**: Hypothesis testing, frequentist confidence intervals, maximum likelihood estimation
**Languages**: German Native Speaker, Spanish B1, French A1

## EXPERIENCE

**Amazon Alexa Applied Science Intern: NLP in Health** Jun - Sep 2020 | Seattle, WA
Used seq2seq models to summarize proprietary text and developed a novel algorithm that removed pathologies and improved fluency. Won 1st place in code competition against 26 SDEs.

**Airbnb Internship 2020 Recipient (Internship deferred due to COVID-19)**

**Studying Adversarial Attacks on Explainable CNNs in NLP** Feb - Jun 2020 | Cambridge, MA
Extending explainable AI in NLP literature by implementing a CNN for text classification, studying the Slot Activation Vectors and testing whether inserting maximizing possible ngrams results in misclassification of examples; More complicated adversarial attacks would be a natural extension

**Minor to Fatal: Predicting Injury Severity in Traffic Data** Sep - Dec 2019 | Cambridge, MA
Visualised and performed PCA on US traffic Crash Report Sampling System data to identify alcohol consumption and time of day of the accident as the main factors; used Logistic Regression, CART, Random Forests, SVMs, NNs and boosting to predict injury severity with 84% accuracy

**Participant in Yale Graduate Case Competition** Jul 2015 | New Haven, CT
Developed and presented a sustainable growth strategy for Netflix to keep its market share, make profit, and leverage its brand by analyzing industry trends and competitors; won 2nd place out of 28 teams.

## RESEARCH

***Goal***: Exploring the generative statistical model of nature by colliding particles and observing probabilistic outcomes with camera-like detectors to understand the discrepancy between our understanding of the dynamics of the universe (Astrophysics) and its constituent parts (Particle Physics) in the following bolded steps. Personal contributions at MIT, Manchester, and CERN are listed below:

**Hardware: Electronics to Pixels**; For a 1,000 people experiment, oversaw 670 hours of the running period as specialist and 110 hours as Shift Leader; Demonstrated radiation hardness of CMOS sensors

**Reconstruction: Pixels to Tracks**; Developed and updated a novel hybrid deep learning approach to vertexing, a GPU-friendly technique to determine the origin of particles, given detector pixel values

**Data Selection: 5TB/s to 2GB/s**; Reduced data rates (=10% of Facebook's data) as analysis group liaison and summary speaker; proposed further data reduction through VAEs and GANs **(ICLR 2020)**

**Analysis: Messy to Clean**; Gathered 200TB of heterogeneous dirty data and combined them creatively with deep domain expertise to look for both minimal and nonminimal "Dark Photons"; estimated systematic errors conservatively and suggested a new method to tackle AI Fairness in Physics

**Hypothesis Testing: Histograms to Discovery**; Introduced a high dimensional two sample statistical test utilizing traditional and deep ML for dimensionality reduction coupled with a 1D KS test

## TEAM WORK

President of MIT Physics Graduate Student Council [1.5 years]; President of MIT Triathlon Club; Personally drafted MIT Physics **Value Statement**; 2nd place Boston Regional Datathon Citadel; "Best Science Case" as team Head of Science **European Space Agency** Alpbach Summer School; 2nd place Yale Graduate Case Competition; 3rd place in MIT IAP "ML in Critical Care" Hackathon; Weekly **primary school mentor** at Berkeley Engineers and Mentors (BEAM); Volunteer ODSC East; **Goldman Sachs** Finance and Internal Audit Spring Intern; Education Award CERN's "Webfest";

## INTERESTS

Social and Gold Level Ballroom Dancing, Travel (>40 countries), Triathlon (Completed **Ironman®**), Mountaineering, Marathon, Trail Running, Rock Climbing, Fencing