

Exploring Superconductors Using Generative Adversarial Networks

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- Superconductors have the potential to change the world

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- Superconductors have the potential to change the world
- Power transmission

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- Superconductors have the potential to change the world
- Power transmission
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- Superconductors have the potential to change the world
- Power transmission
- Temperature
- Investigation (Device Construction)

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- Superconductors have the potential to change the world
- Power transmission
- Temperature
- Investigation (Device Construction)
 - Trial-and-error process

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- Superconductors have the potential to change the world
- Power transmission
- Temperature
- Investigation (Device Construction)
 - Trial-and-error process
 - Labor and resource-intensive

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- Superconductors have the potential to change the world
- Power transmission
- Temperature
- Investigation (Device Construction)
 - Trial-and-error process
 - Labor and resource-intensive
 - Every material's phase diagram must be completely mapped out

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- Shorten the amount of time necessary to find a novel superconductor

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- Shorten the amount of time necessary to find a novel superconductor
- Allow researchers to inform their selection of a superconductor for experimental verification through a data-driven method

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- Taken from UCI (University of California, Irvine)
Machine Learning Repository

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- Taken from UCI (University of California, Irvine) Machine Learning Repository
- 21,263 examples with 81 features

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- Taken from UCI (University of California, Irvine) Machine Learning Repository
- 21,263 examples with 81 features



Figure: UCI Machine Learning Repository

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- Generative adversarial network (GAN)

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- Generative adversarial network (GAN)
- Generator uses the data given to it to create a model that can output data

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- Generative adversarial network (GAN)
- Generator uses the data given to it to create a model that can output data
- The discriminator "checks" this data

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- Generator uses the data given to it to create a model that can output data
- The discriminator "checks" this data
- The two models train each other

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- Data was generated by the GAN

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- Data was generated by the GAN
- This data can now be tested to evaluate novel superconductors

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- Usage of model can result in expedited time to find new superconductors

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- Usage of model can result in expedited time to find new superconductors
- Can be used in conjunction with regression model made on this data (Hamidieh 2018) to find high-temperature superconductors

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- Usage of model can result in expedited time to find new superconductors
- Can be used in conjunction with regression model made on this data (Hamidieh 2018) to find high-temperature superconductors
- Further studies can test the accuracy of this model by experimentally verifying superconductivity in the materials predicted

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