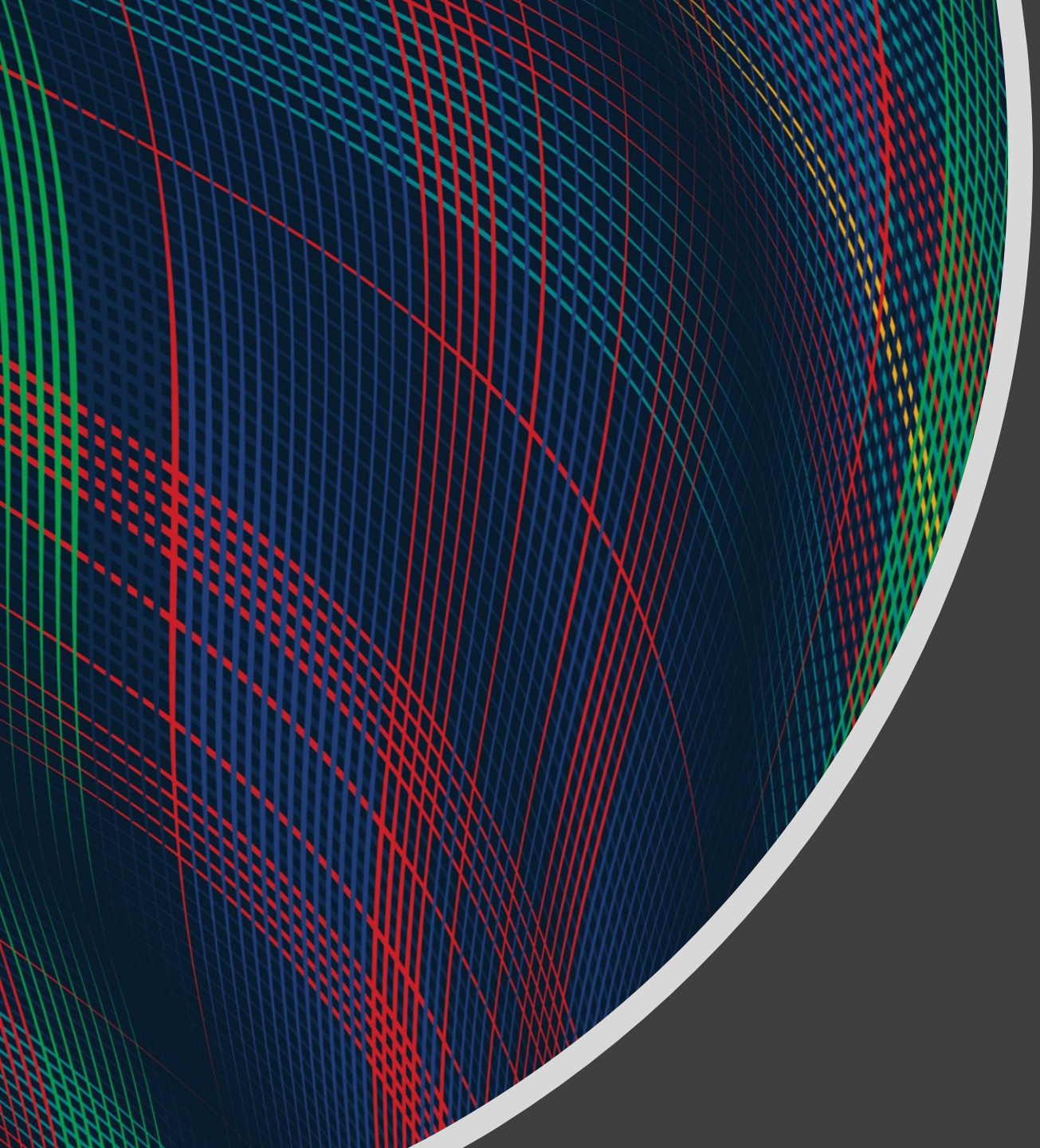
Plan

Wrap-up Overview → Lecture 1 slides

Proof Techniques

- Proof by cases
- Disprove by counterexample
- Proof by contrapositive



10-607 Computational Foundations for Machine Learning

Proof Techniques

Instructor: Pat Virtue

Proof Techniques

Proof by Cases

Proof by Cases

Goal is to prove X

1 $\phi \vee \psi$ Assume

2 Case 1: ϕ

a)

b)

c) $\phi \Rightarrow X$

3 Case 2: ψ

a)

b)

c)

d) $\psi \Rightarrow X$

4 X by $\vee$ elimination

Proof by Cases

Proposition: Let $a, b \in \mathbb{Z}$. If ab is even, then either a is even or b is even (or both).

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→ whiteboard

Proof Techniques

Proof by cases

Disproof by counterexample

- One example is not sufficient to prove
- One counterexample is sufficient to disprove

Disprove by counterexample

Proposition: Let a, b $\in \mathbb{Z}$. If a is odd and b is odd, then a+b is odd

Poll 1

Given model m: {A: True, B: False}

Does m satisfy the following sentence:

$(A \Rightarrow B) \Leftrightarrow (\neg B \Rightarrow \neg A)$

i. Yes

ii. No

iii. Not enough information

iv. Syntax error in sentence

Poll 2

Truth table for $(A \Rightarrow B) \Leftrightarrow (\neg B \Rightarrow \neg A)$

How many rows do we need (excluding a header)?

i. 2
ii. 4
iii. 6
iv. 8
v. 16

Poll 3

Truth table for $(A \Rightarrow B) \Leftrightarrow (\neg B \Rightarrow \neg A)$

How many columns should we have?

i. 2

ii. 3

iii. 4

iv. 5

v. 6