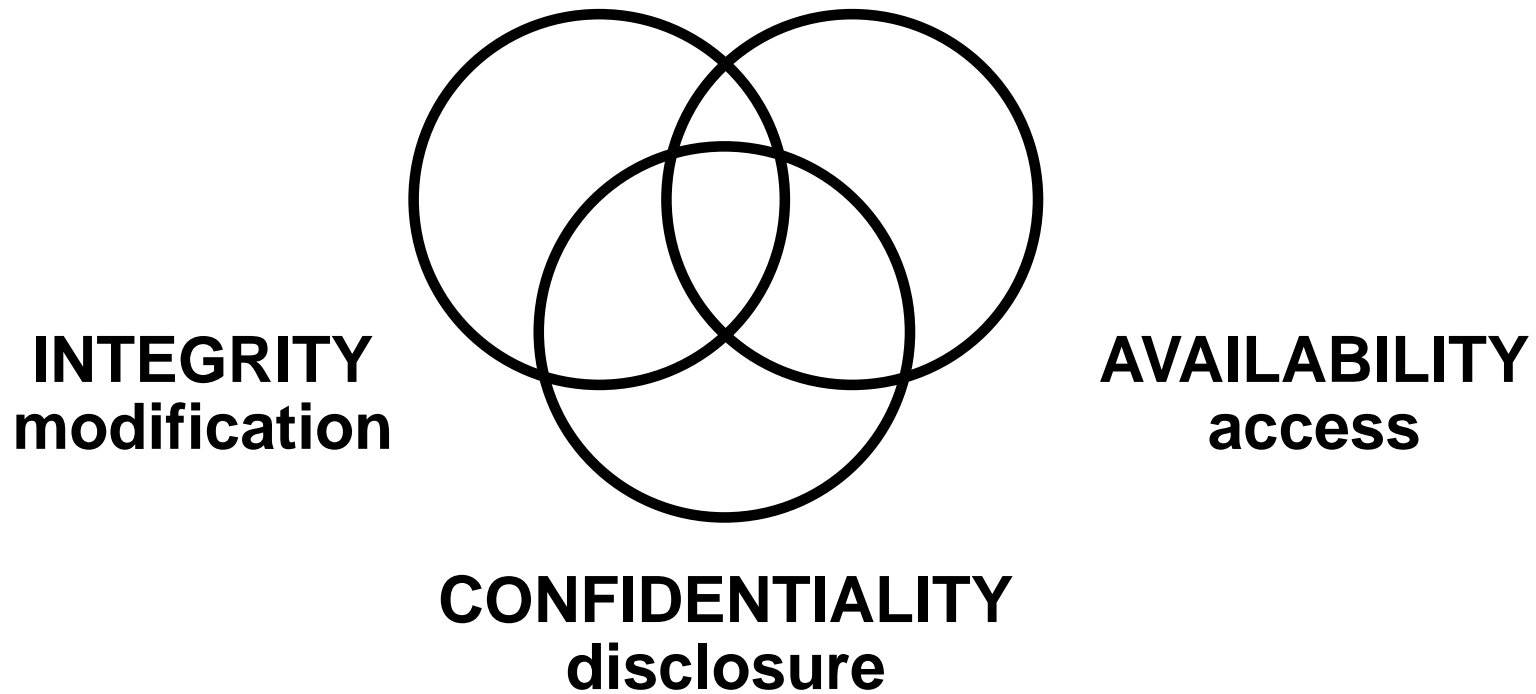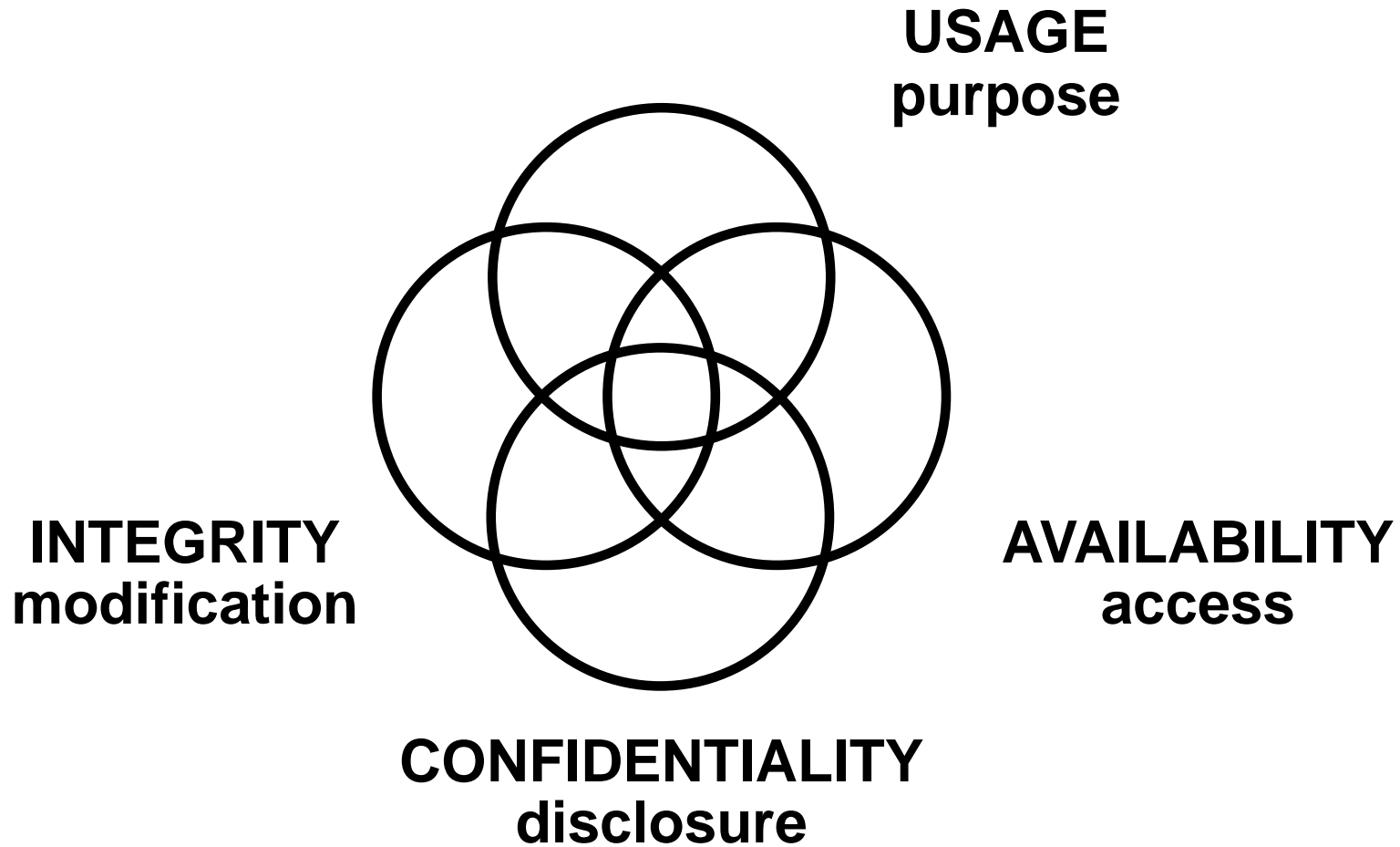# Cyber Security Research:
A Personal Perspective

Prof. Ravi Sandhu
Executive Director and Endowed Chair
Department of Computer Science
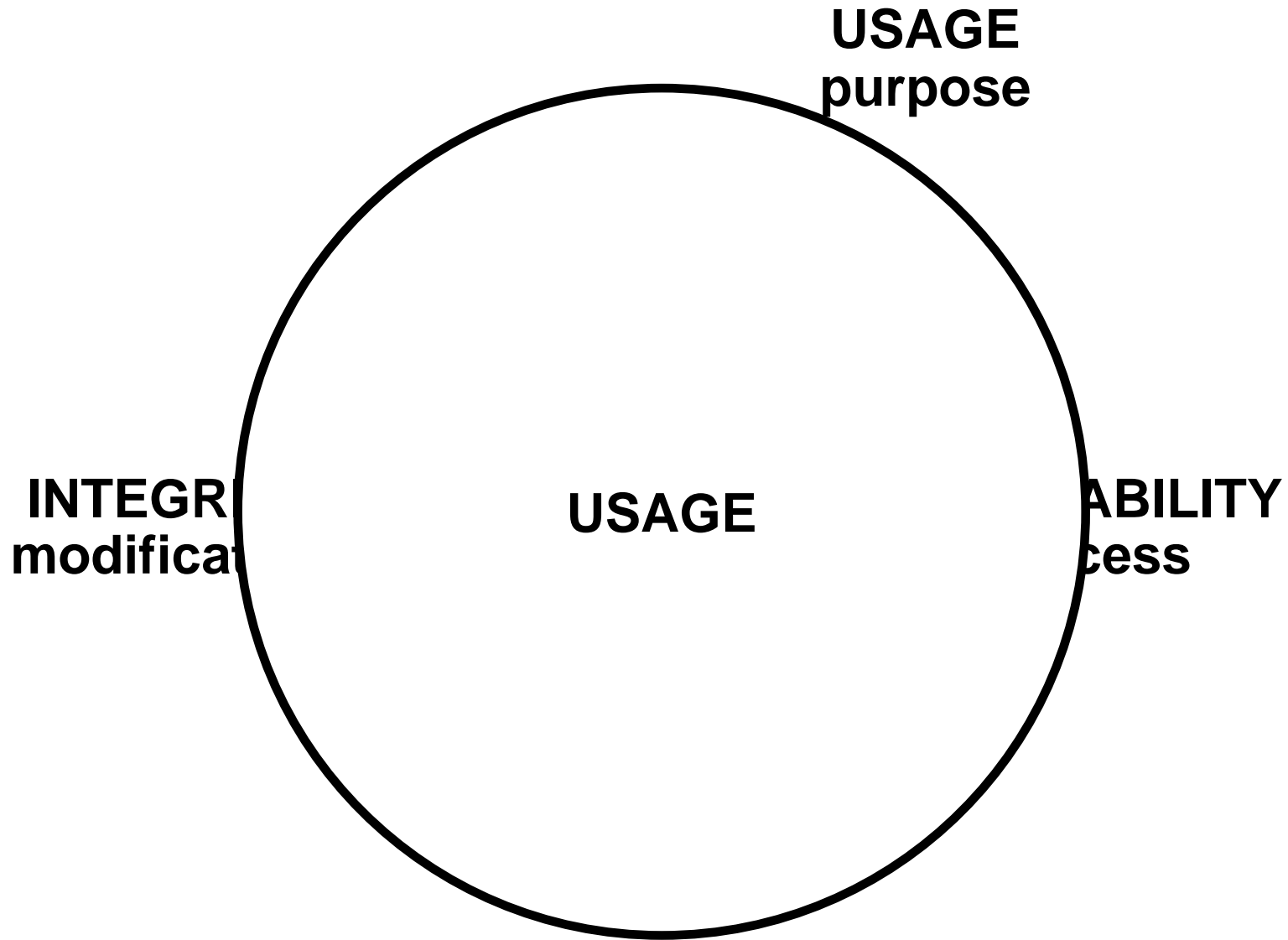University of Texas at San Antonio

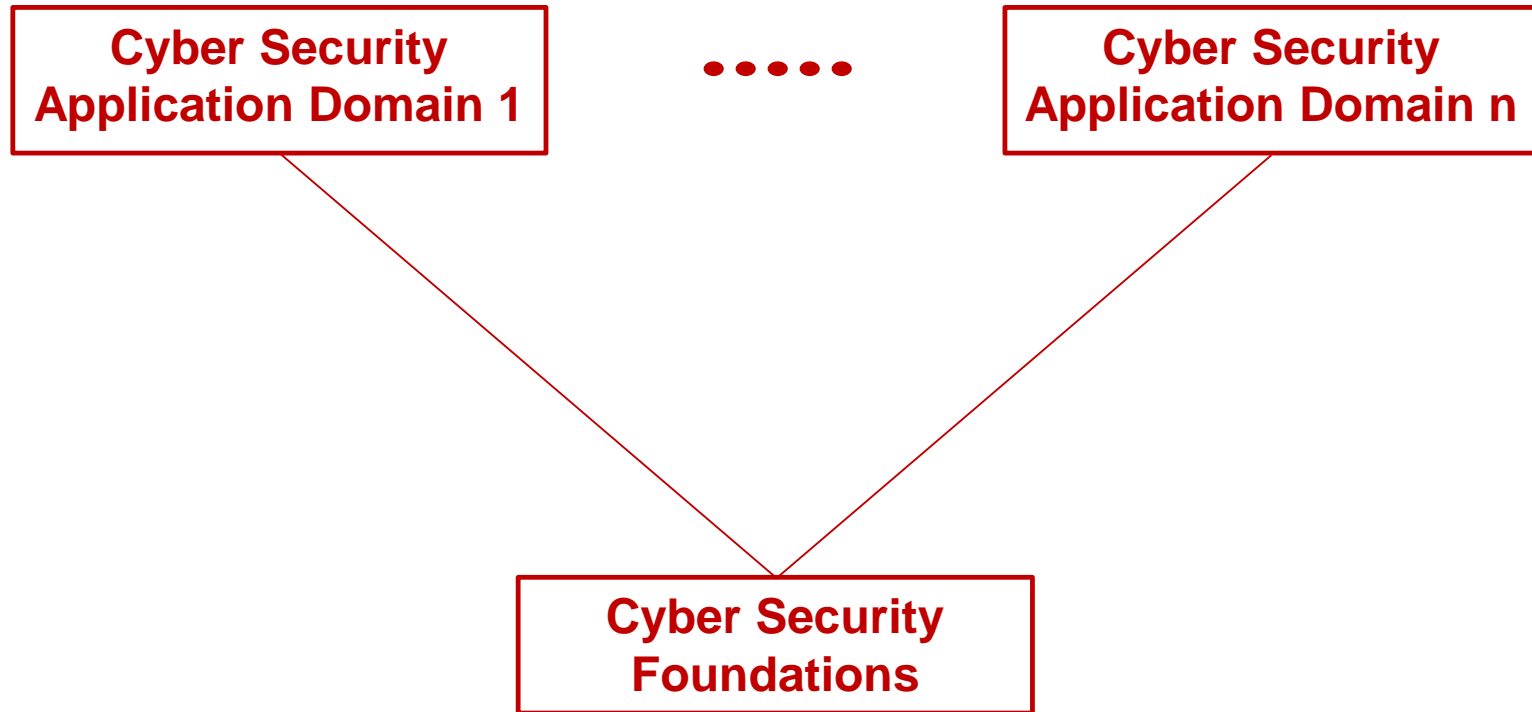CS 7123 Research Methods
Nov 9, 2016

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World-Leading Research with Real-World Impact!

➢ Cyberspace will become orders of magnitude more complex and confused very quickly
  ❖ Cyber and physical distinction will disappear
  ❖ Threats will go beyond money to physical harm
➢ Overall this is a very positive development and will enrich human society
  ❖ It will be messy but need not be chaotic!
  ❖ Cyber security research/practice are loosing ground
➢ This is an exciting time for cyber security researchers
  ❖ UTSA offers exciting research opportunities

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modification

AVAILABILITY
access

CONFIDENTIALITY
disclosure

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purpose

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modification

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World-Leading Research with Real-World Impact!

I·C·S
The Institute for Cyber Security

UTSA®

| Cloud Computing | Social Computing | Internet of Things | Big Data |

Authentication
versus
Authorization

Access Control
Role-Based
Attribute-Based
Relationship-Based
Provenance-Based

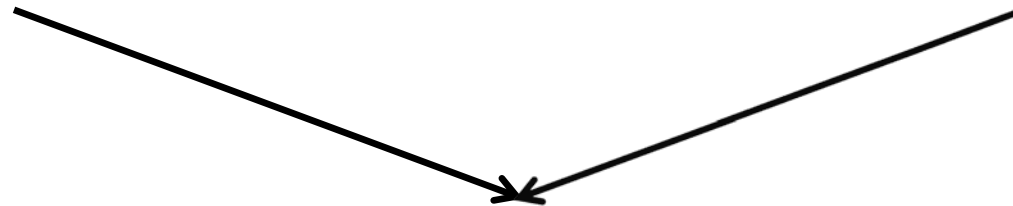*World-Leading Research with Real-World Impact!*

Access Control

Discretionary Access Control (DAC), 1970

Mandatory Access Control (MAC), 1970

Role Based Access Control (RBAC), 1995

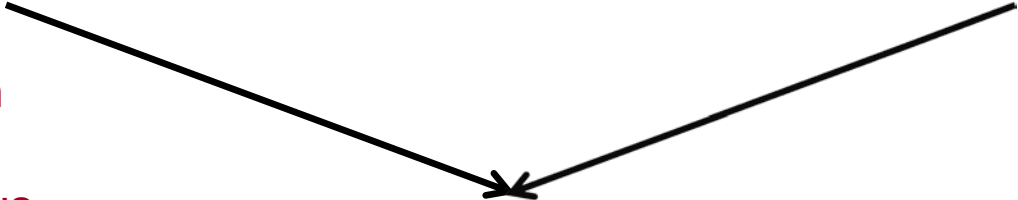**Attribute Based Access Control (ABAC), ????**

Access Control

Discretionary Access Control (DAC), 1970

Mandatory Access Control (MAC), 1970

Owner of a resource can grant access to anyone
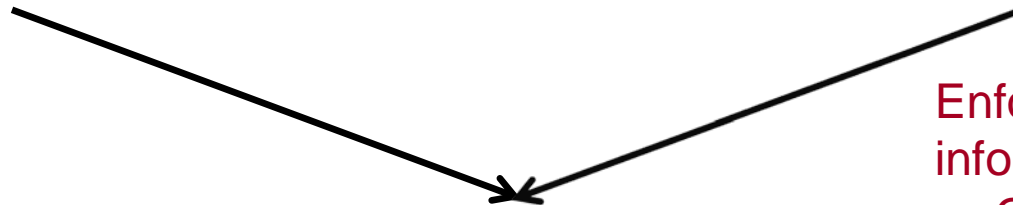- Anyone: too dangerous
- Copy versus read

Role Based Access Control (RBAC), 1995

Attribute Based Access Control (ABAC), ????

Access Control

Discretionary Access Control (DAC), 1970

Mandatory Access Control (MAC), 1970

Role Based Access Control (RBAC), 1995

Enforce one-directional information flow
- Covert channels
- Inference

Attribute Based Access Control (ABAC), ????

Discretionary Access Control (DAC), 1970

Mandatory Access Control (MAC), 1970

Role Based Access Control (RBAC), 1995
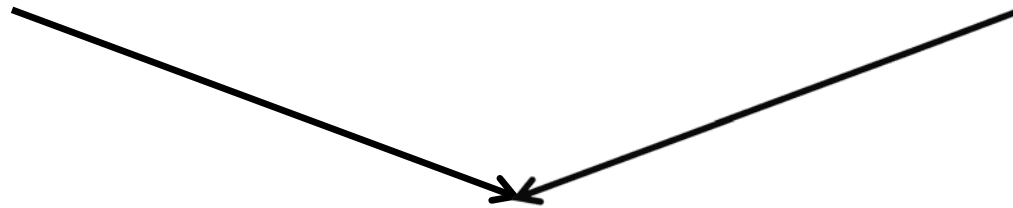
Manage permissions based on roles and constraints
- Role design
- Role explosion

Attribute Based Access Control (ABAC), ????

World-Leading Research with Real-World Impact!

Access Control

Discretionary Access Control
(DAC), 1970

Mandatory Access Control
(MAC), 1970

Role Based Access Control
(RBAC), 1995

Unify, mitigate shortcomings
and include contextual and
mutable attributes
• Policy design
• Policy comprehension

**Attribute Based Access Control
(ABAC), ????**

Attributes

Security
Access Control
Trust
Risk

Relationships

Provenance

Cloud Computing

Social Computing

Internet of Things

Big Data

Access Control
Role-Based
Attribute-Based
Relationship-Based
Provenance-Based

World-Leading Research with Real-World Impact!