

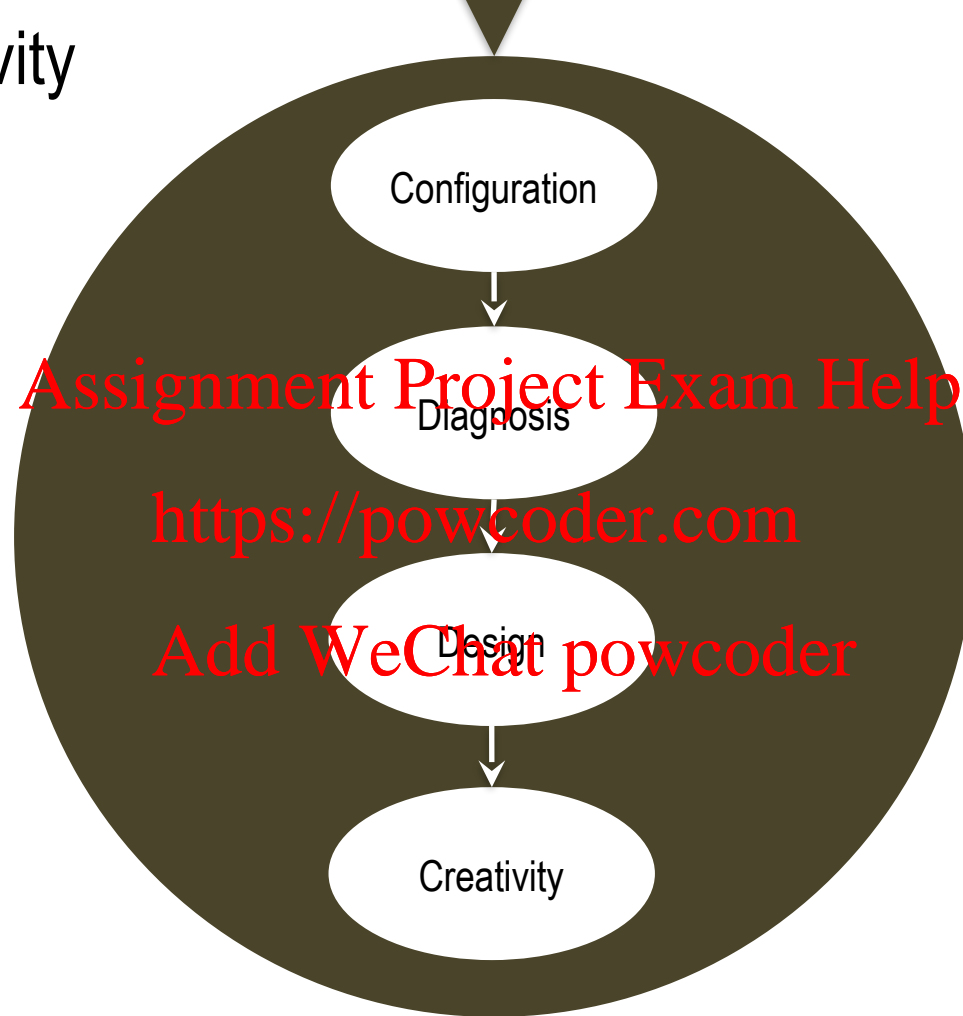
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Diagnosis

Design & Creativity



Lesson Preview

- Defining diagnosis
- Data and hypothesis spaces
- Mapping data to hypotheses
- Two views of diagnosis

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Patient:	Illnesses:
Normal	A: <ul style="list-style-type: none"> Alphaitis: Elevated A, Reduced C, Elevated F
High	B: <ul style="list-style-type: none"> Betatosis: Elevated B, Reduced C, Elevated E, Reduced
Low	C: <ul style="list-style-type: none"> Gammanoma: Elevated D, Elevated E, Elevated F Deltacol: Elevated B, Reduced C
Normal	D: <ul style="list-style-type: none"> Epsiculus: Reduced H Zetad: Elevated B, Reduced C, Reduced E, Reduced F
Normal	E: <ul style="list-style-type: none"> Etaemia: Elevated A, Reduced D, Reduced H
Normal	F: <ul style="list-style-type: none"> Thetadesis: Elevated B, Reduced C, Reduced H
Normal	G: <ul style="list-style-type: none"> Iotalgia: Elevated A, Reduced E, Elevated F, Elevated G
Normal	H: <ul style="list-style-type: none"> Kappacide: Reduced A, Reduced F, Reduced G Lambdacrite: Reduced A, Reduced E, Reduced F,
Low	Reduced G

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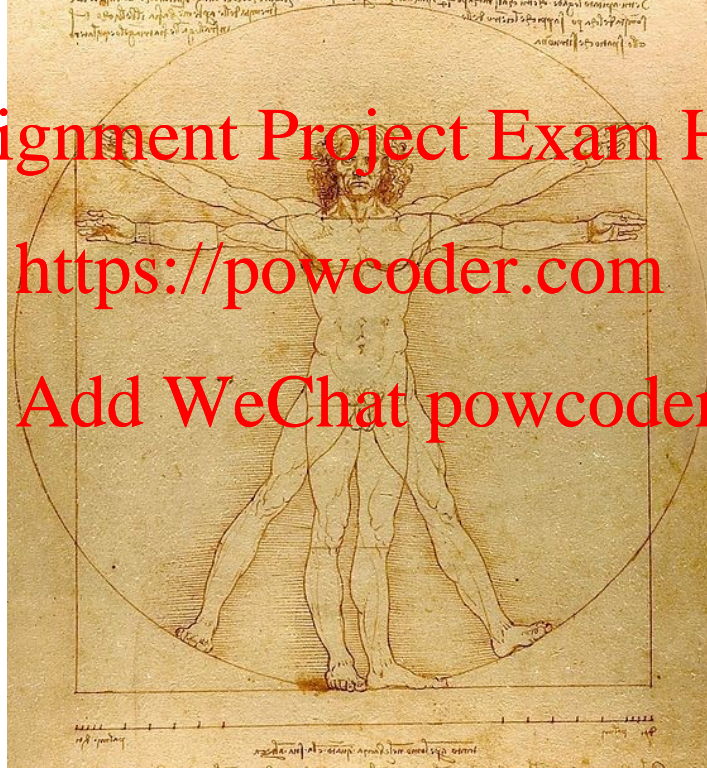
What illness (or set of illnesses) would you use to diagnose this patient?

Diagnosis: To determine what is wrong with a malfunctioning device.

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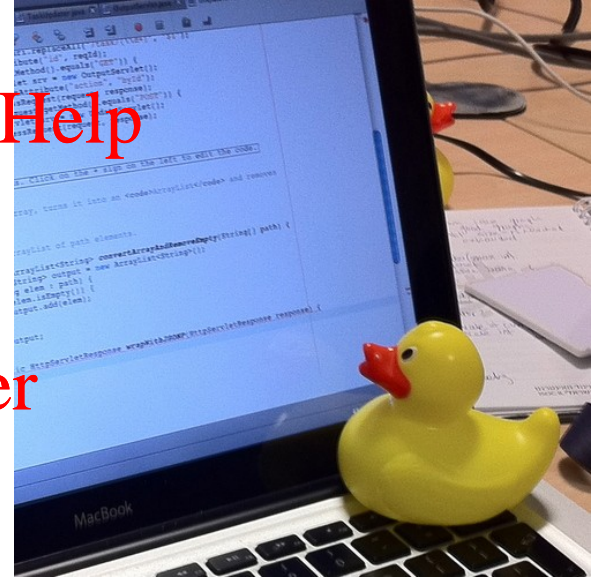
A photograph of the engine compartment of a vehicle, showing a Nissan V6 3000 24-Valve engine. The engine cover is blue and features the text "NISSAN V6 3000 24-VALVE". Various hoses, belts, and fluid reservoirs are visible. A red watermark "Assi" is overlaid on the right side of the image.

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Data Space

D_1

D_2

D_3

D_4

D_5

D_6

D_7

D_8

D_9

D_{10}

D_{11}

D_{12}

Hypothesis Space

H_1

H_2

H_3

H_4

H_5

H_6

H_7

H_8

H_9

H_{10}

H_{11}

H_{12}

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Abstract

Data Space

D_1

D_2

D_3

D_4

D_5

D_6

D_7

D_8

D_9

D_{10}

D_{11}

D_{12}

Hypothesis Space

H_1

H_2

H_3

H_4

H_5

H_6

H_7

H_8

H_9

H_{10}

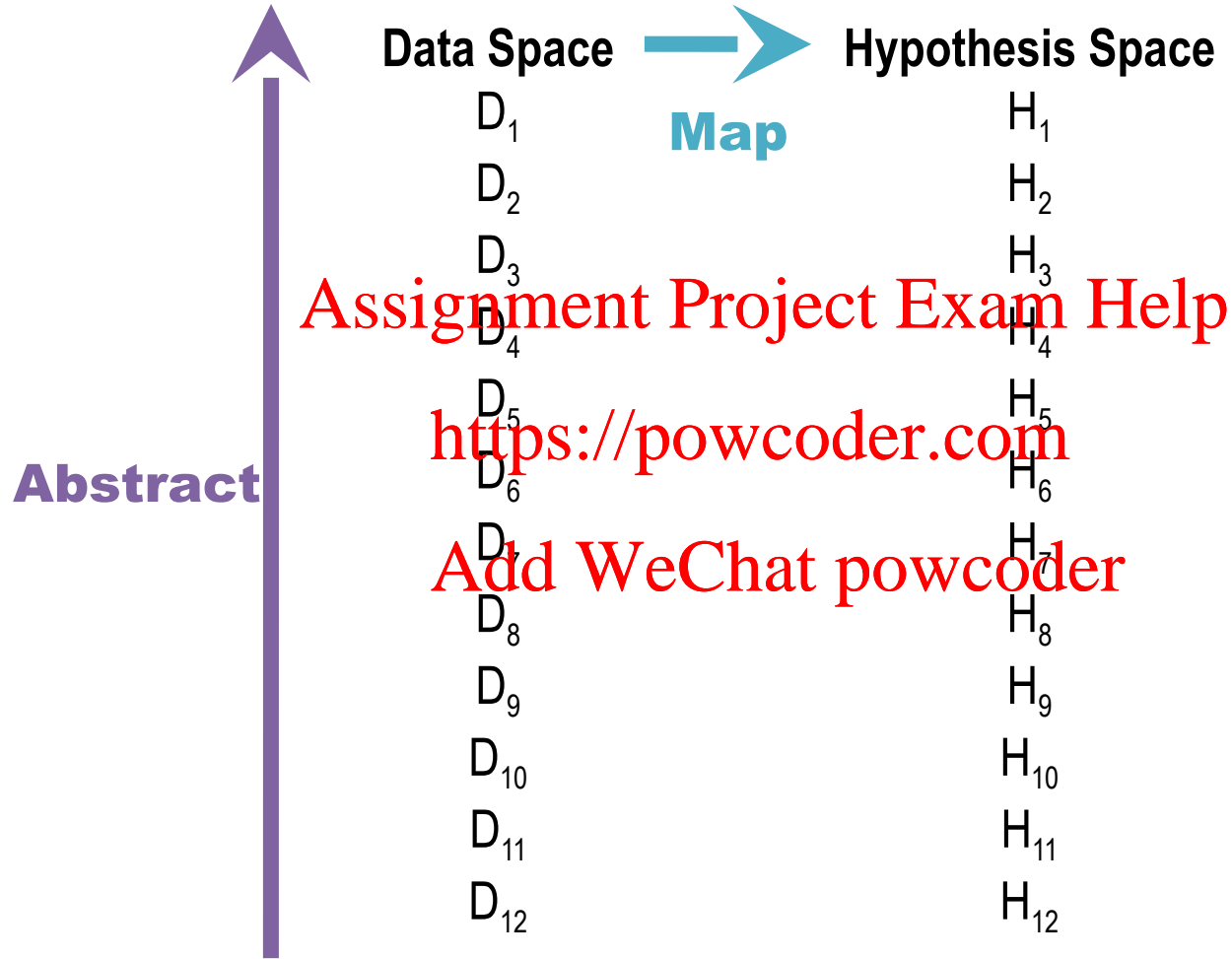
H_{11}

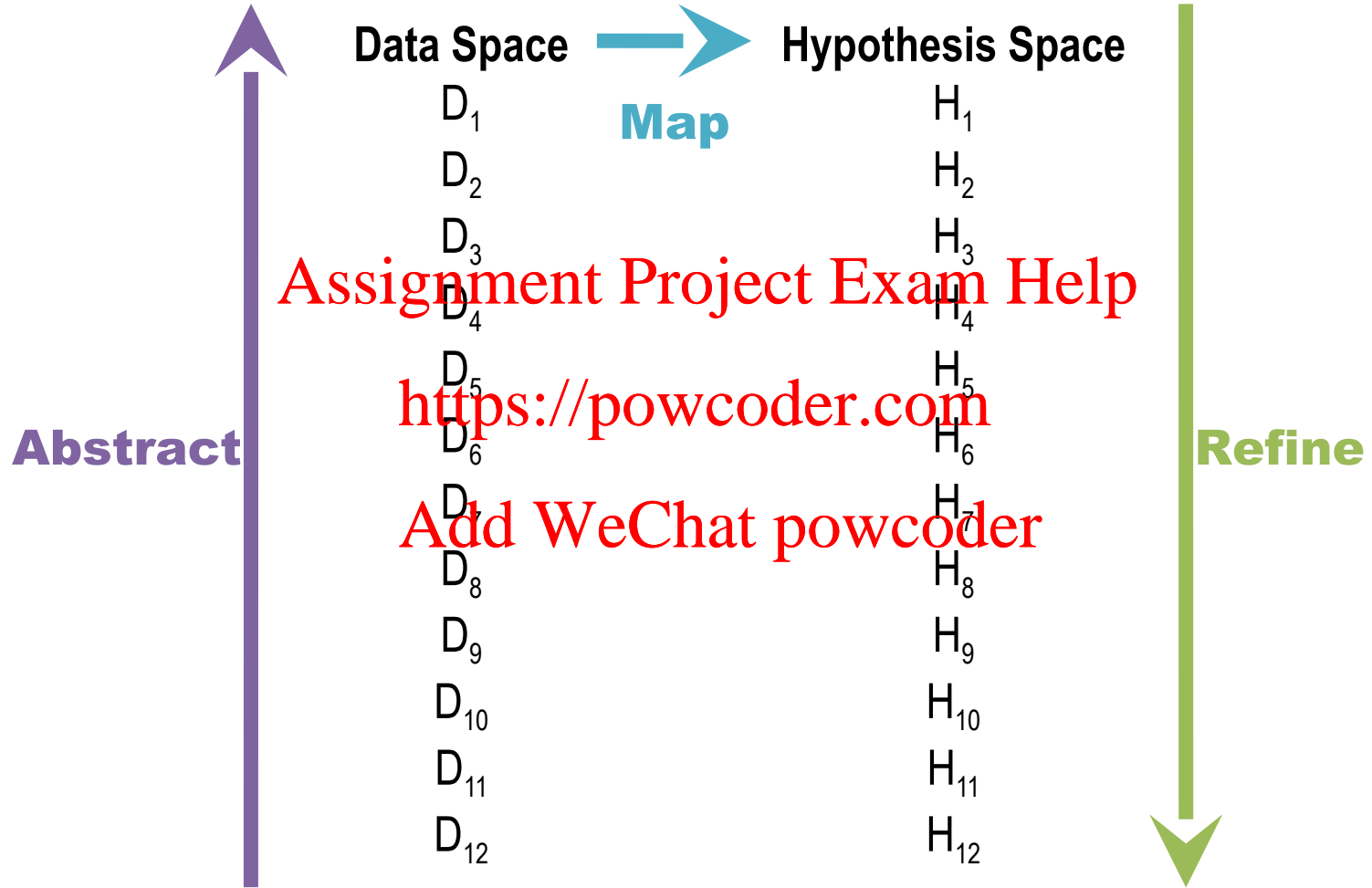
H_{12}

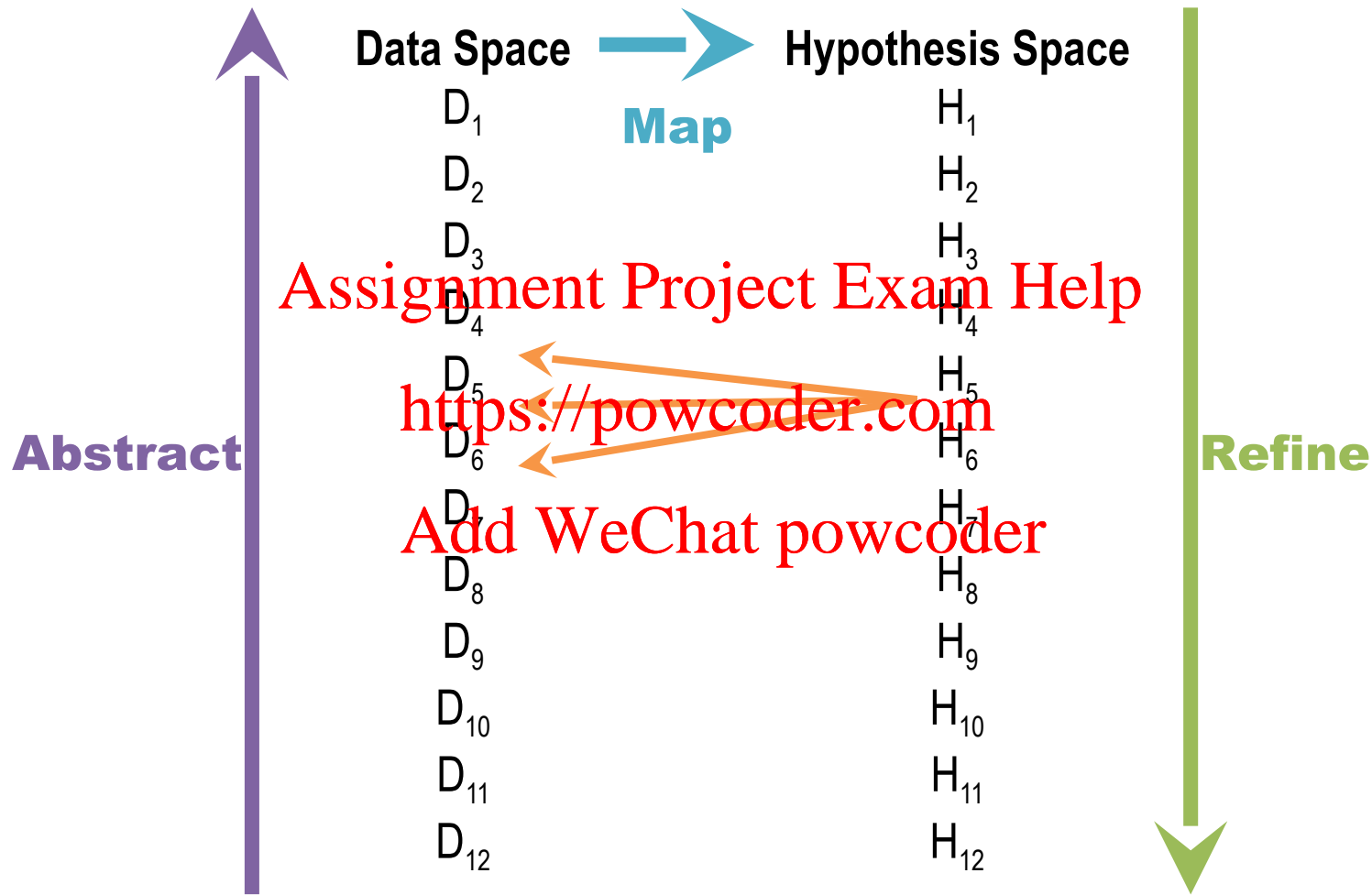
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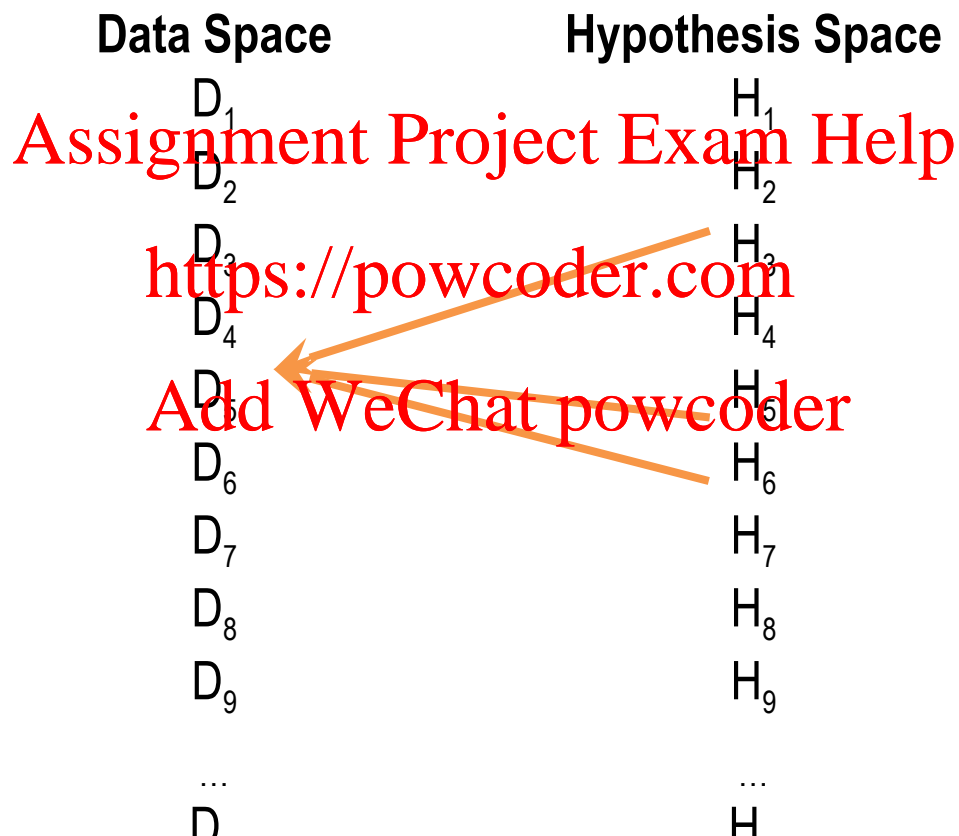
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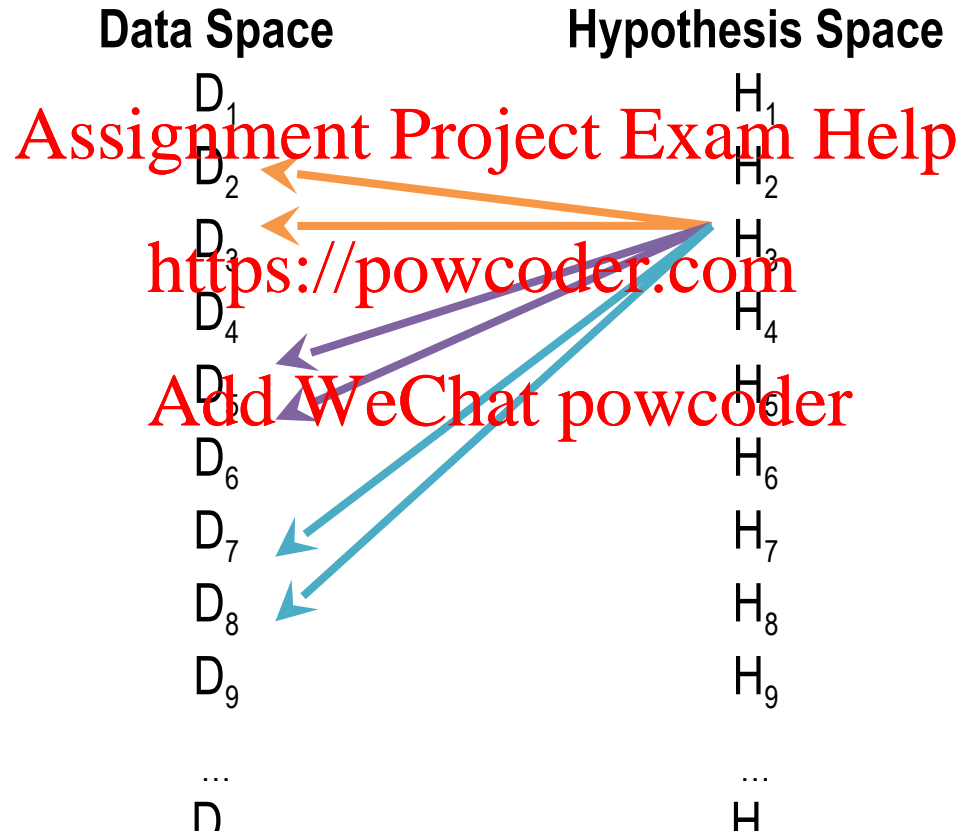




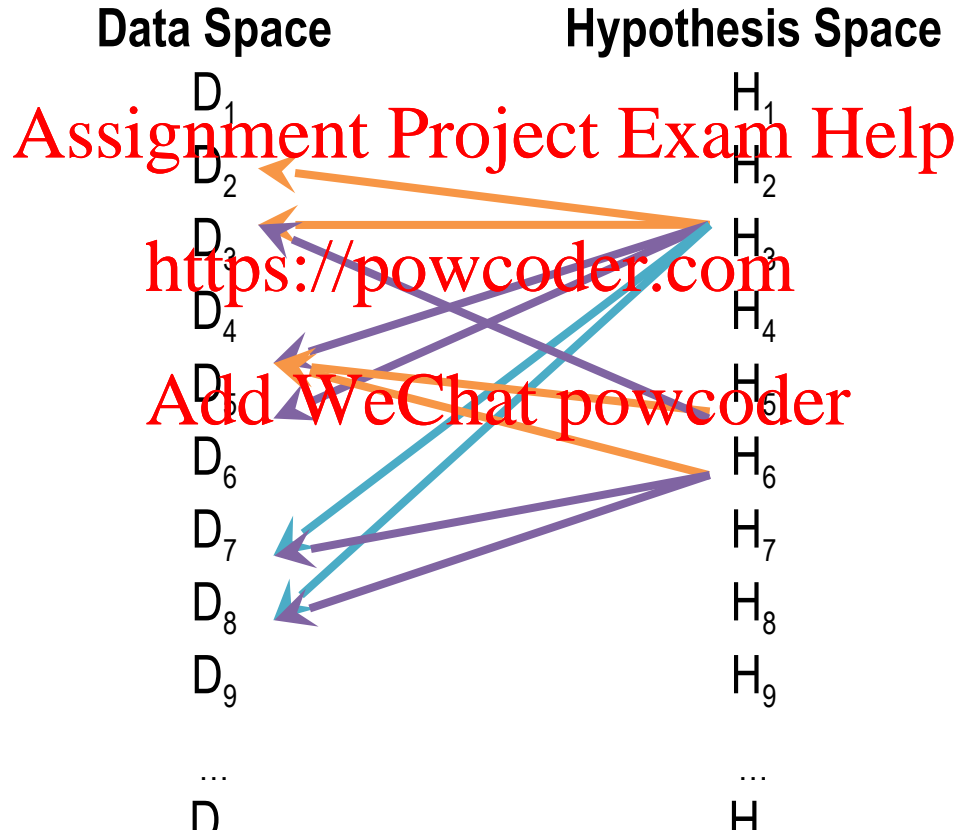
Problem #1: One data point, multiple hypotheses.



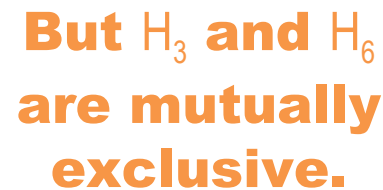
Problem #2: One hypothesis, multiple sets of data.



Problem #3: Multiple hypotheses, multiple sets of data.



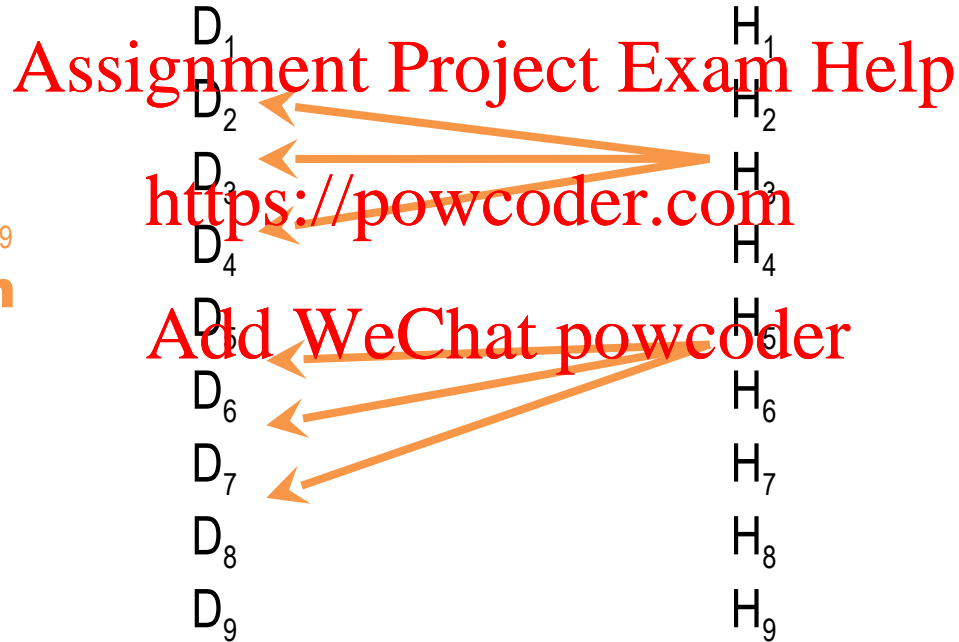
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Problem #5: Interacting data points.

Data Space

Hypothesis Space

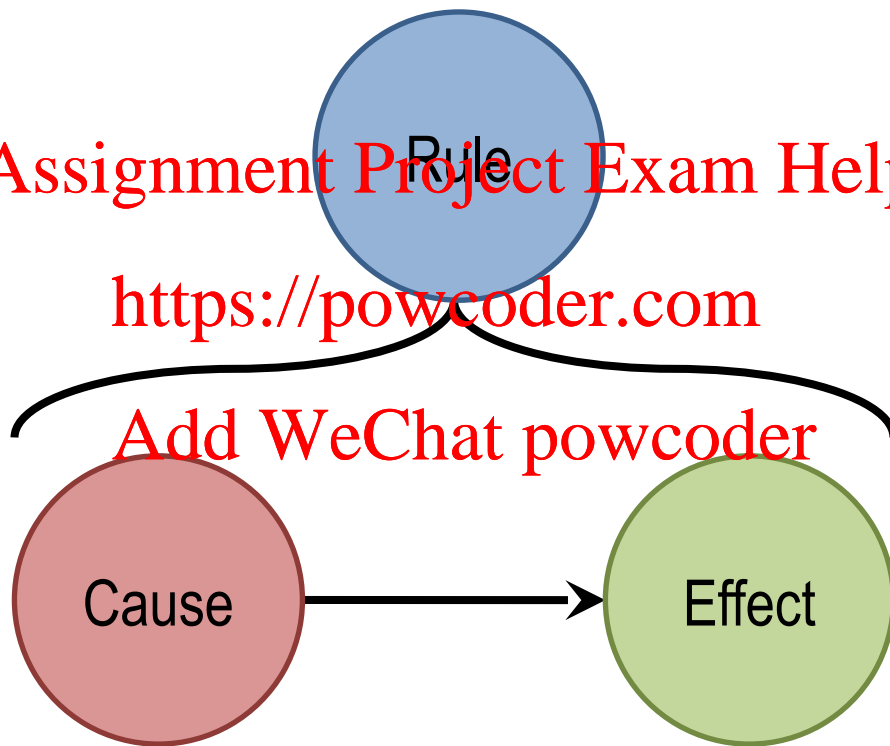


But D_5 and D_9
cancel each
other out.

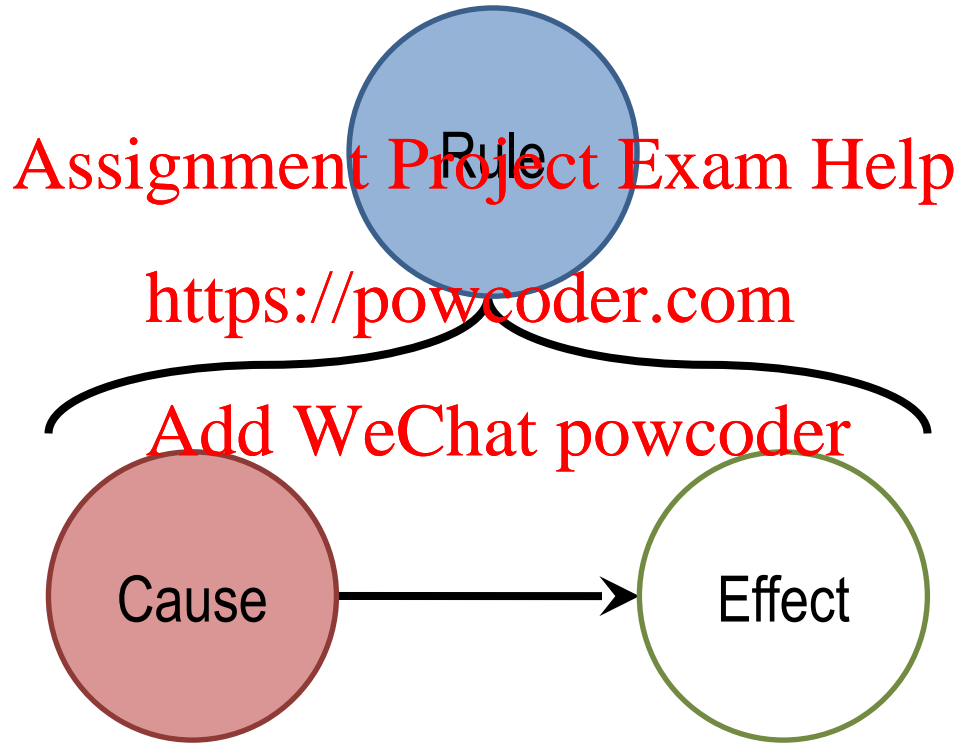
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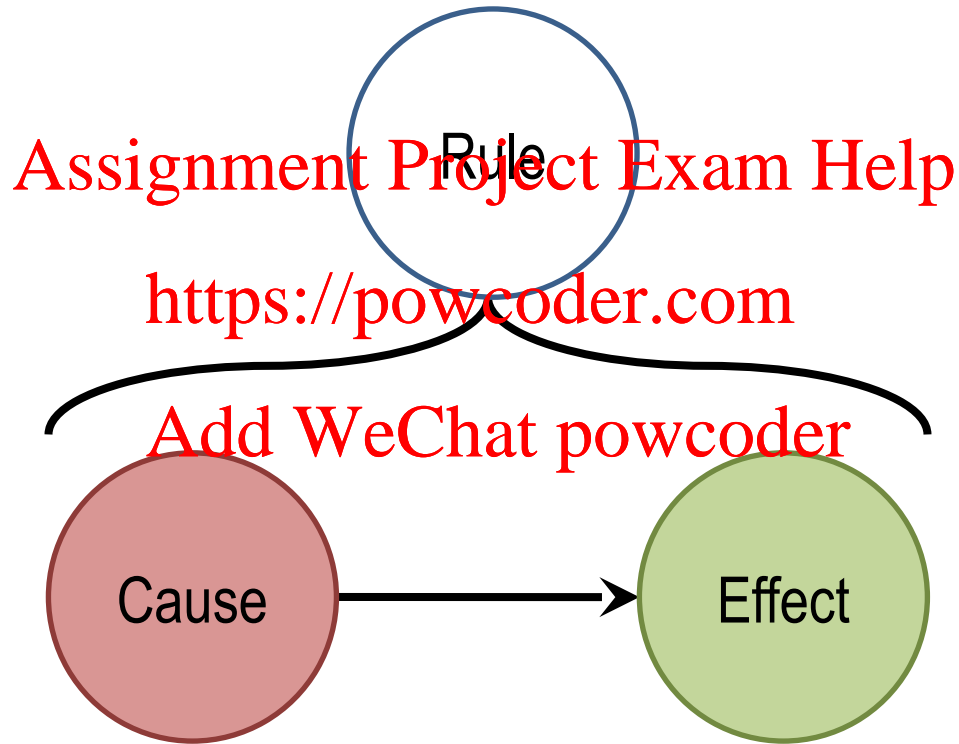
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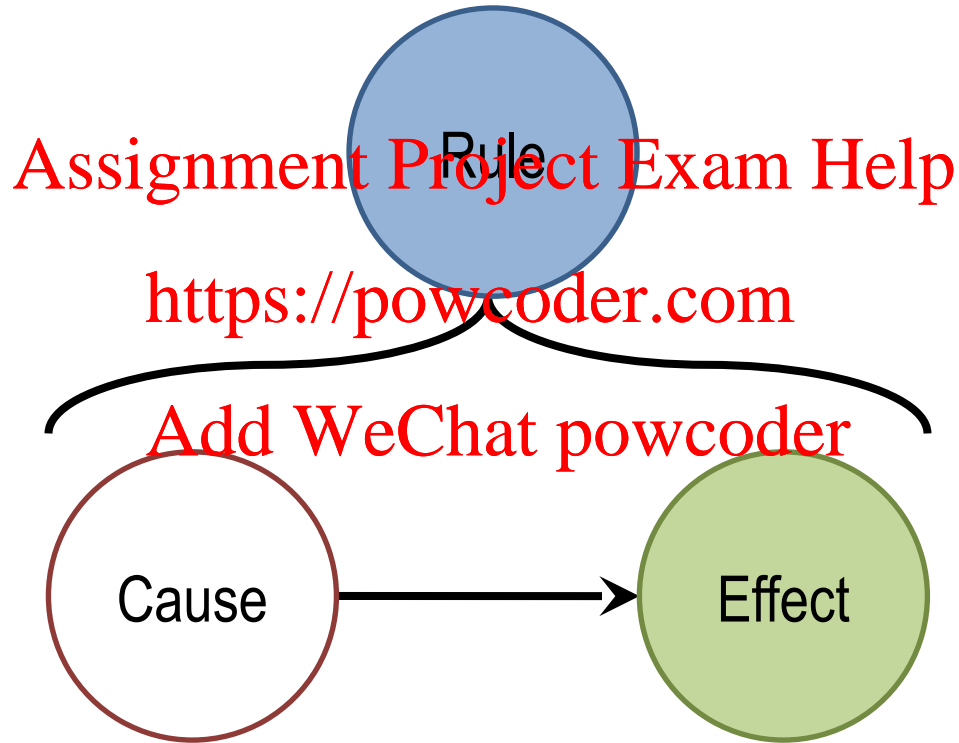
Deduction: Given the rule and the cause, deduce the effect.



Induction: Given a cause and an effect, induce a rule.



Abduction: Given a rule and an effect, abduce a cause.



Patient:	Illnesses:
Normal	A: <ul style="list-style-type: none"> Alphaitis: Elevated A, Reduced C, Elevated F
High	B: <ul style="list-style-type: none"> Betatosis: Elevated B, Reduced C, Elevated E, Reduced
Low	C: <ul style="list-style-type: none"> Gammanoma: Elevated D, Elevated E, Elevated F Deltacol: Elevated B, Reduced C
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Normal	E: <ul style="list-style-type: none"> Etaemia: Elevated A, Reduced D, Reduced H
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Normal	H: <ul style="list-style-type: none"> Lambdacrite: Reduced A, Reduced E, Reduced F,
Low	Reduced G

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What illness (or
set of illnesses)
would you use to
diagnose this
patient?

Criteria for Choosing Hypotheses

1. Hypotheses must cover as much of the data as possible.

Data Space

Hypothesis Space

D_1

D_2

D_3

D_4

D_5

D_6

D_7

D_8

D_9

...

D

H_1

H_2

H_3

H_4

H_5

H_6

H_7

H_8

H_9

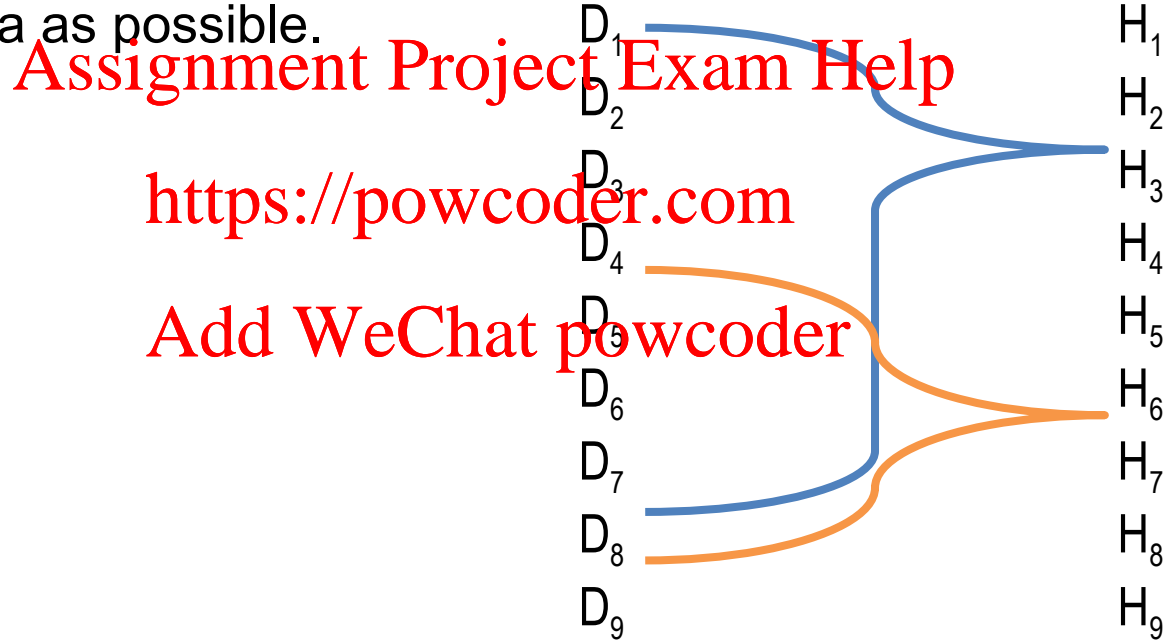
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H

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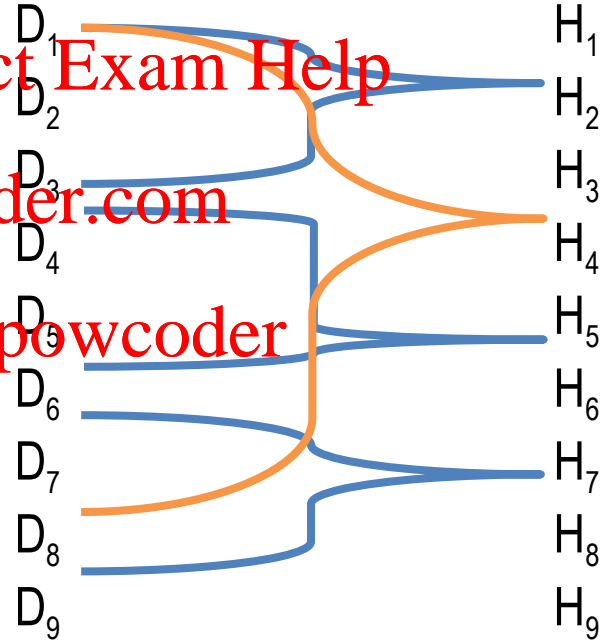
Criteria for Choosing Hypotheses

1. Hypotheses must cover as much of the data as possible.

2. The smallest number of hypotheses ought to be used.

Data Space

Hypothesis Space



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Criteria for Choosing Hypotheses

1. Hypotheses must cover as much of the data as possible.

2. The smallest number of hypotheses ought to be used.

3. Some hypotheses may be more likely than others.

Data Space

D_1

D_2

D_3

D_4

D_5

D_6

D_7

D_8

D_9

...

D

Hypothesis Space

H_1

H_2

H_3

H_4

H_5

H_6

H_7

H_8

H_9

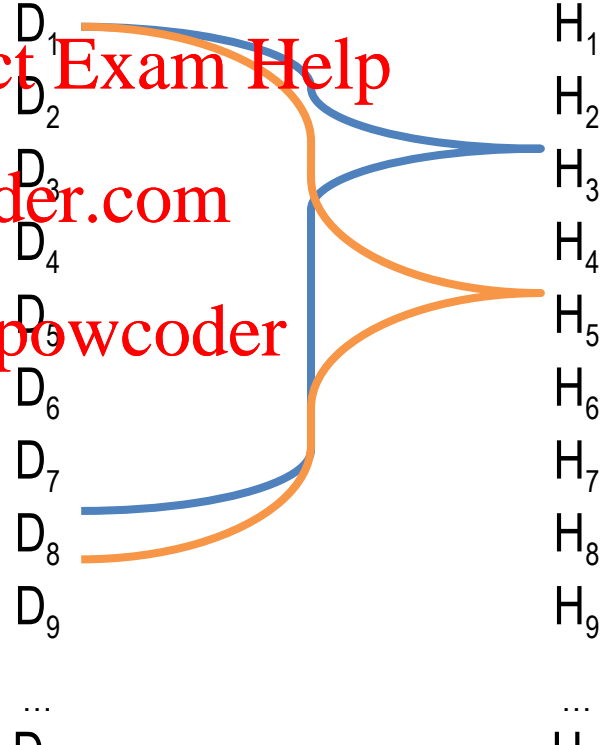
...

H

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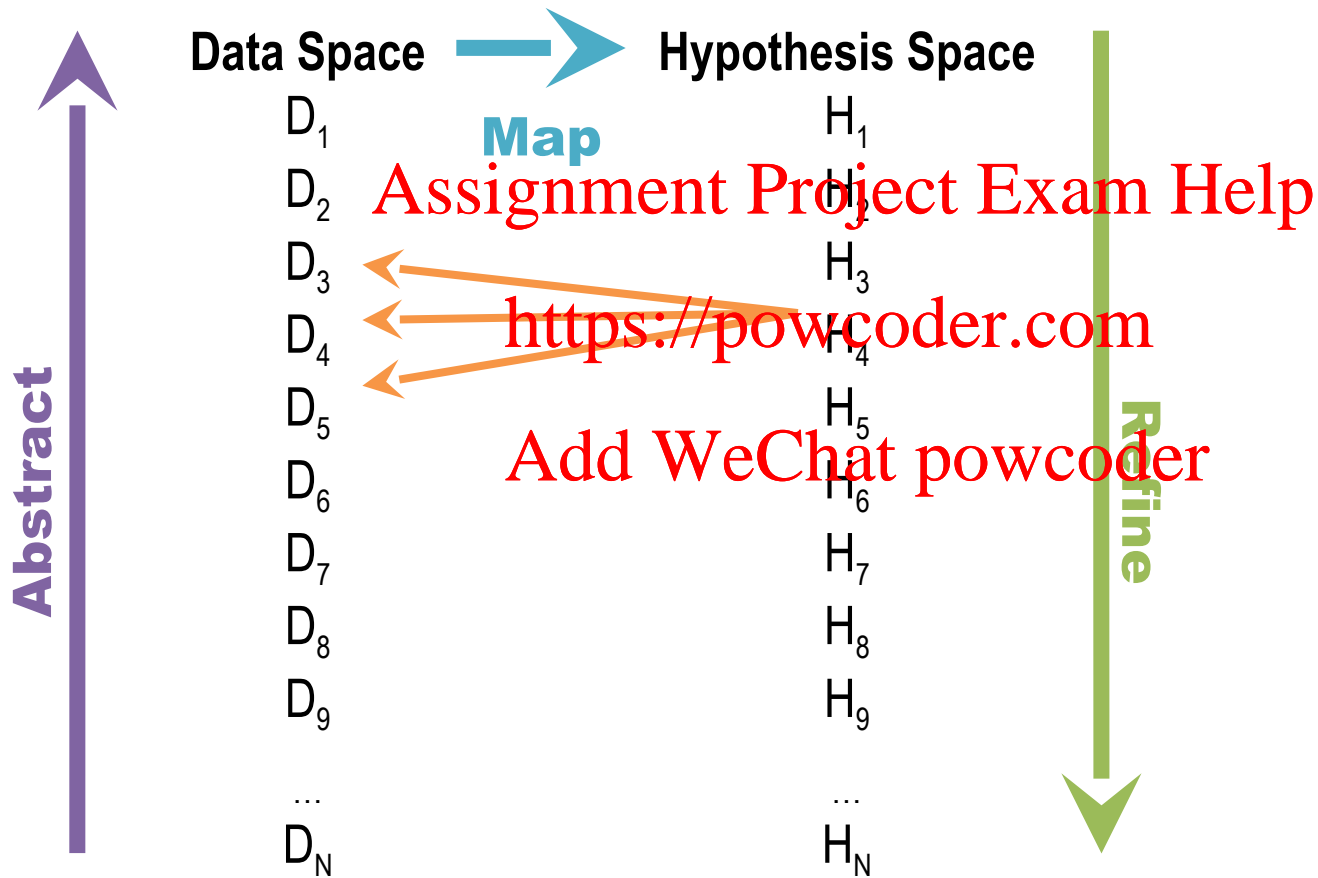
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High	B: <ul style="list-style-type: none"> Betatosis: Elevated B, Reduced C, Elevated E, Reduced
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Normal	G: <ul style="list-style-type: none"> Iotalgia: Elevated A, Reduced E, Elevated F, Elevated G Kappacide: Reduced A, Reduced F, Reduced G
Low	H: <ul style="list-style-type: none"> Lambdacrite: Reduced A, Reduced E, Reduced F, Reduced G

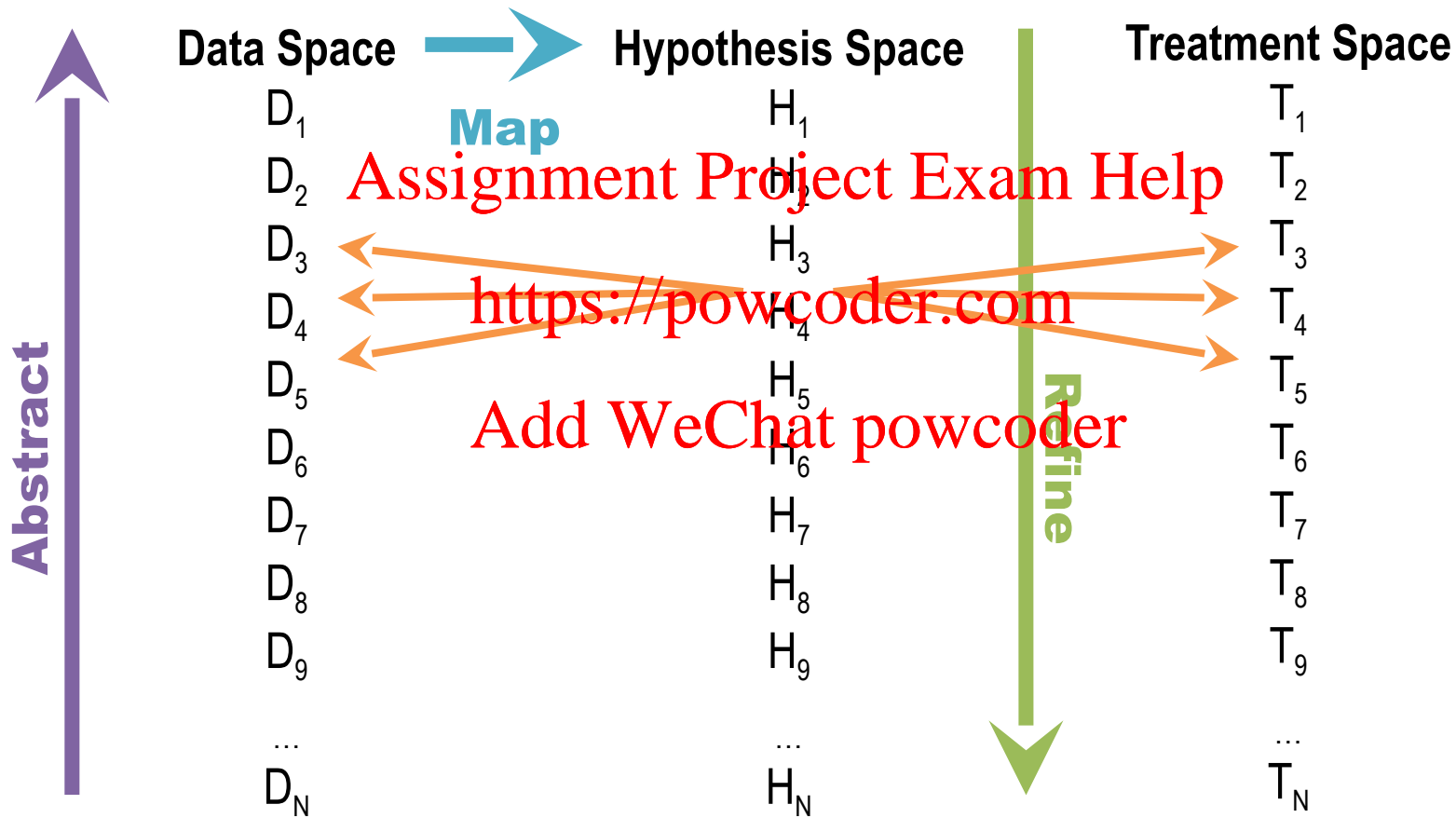
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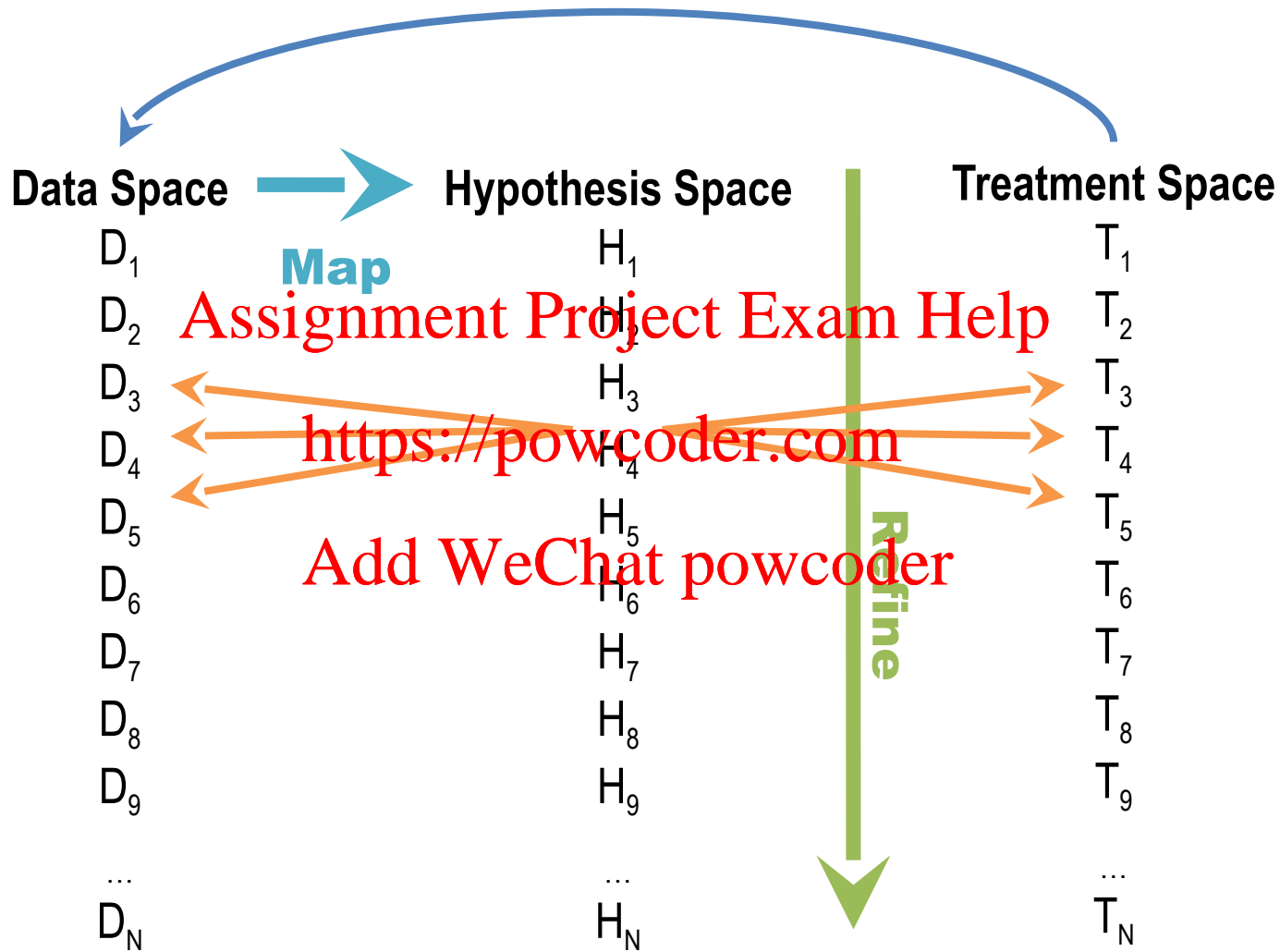
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What illness (or set of illnesses) would you use to diagnose this patient?





Abstract



What constraints dictated the design of this chair?

Chair
mass :
160g
cost :
\$16
legs :
seat :
arms :
back :

Chair	Legs
	count : 4
	size : 10g
	material : metal
	cost : \$4.00
Chair	Seat
	size : 100g
	material : metal
	cost : \$10.00
Chair	Arms
	size : 0g
	material : N/A
	cost : \$0.00
Chair	Back
	size : 20g
	material : metal
	cost : \$2.00

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Assignment

How would you use diagnosis to design an agent that could answer
Raven's progressive matrices?

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To recap...

- Defining diagnosis
 - Process of diagnosis
 - Diagnosis as classification
 - Diagnosis as abduction
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