Forward, Backward, Inward, Outward and Omniward Chaining

Nil Geisweiller

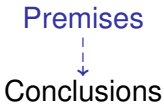
SingularityNET Foundation

Inference Tree

- Formal proof as *tree*
- Axioms as *leaves*
- Theorem as *root*

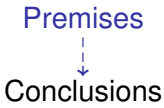
$$\dfrac{\dfrac{}{P}\,(\mathrm{P}) \qquad \dfrac{\dfrac{}{P \to Q}\,(\mathrm{PQ}) \qquad \dfrac{}{Q \to R}\,(\mathrm{QR})}{P \to R}\,(\text{Deduction})}{R}\,(\text{Modus Ponens})$$

Forward Chaining



Premises: P, $P \to Q$, $Q \to R$

Forward Chaining



Premises: P, $P \to Q$, $Q \to R$

$$\frac{\dfrac{}{P \to Q}\ \text{(PQ)} \qquad \dfrac{}{Q \to R}\ \text{(QR)}}{}$$

Forward Chaining

Premises: P, $P \to Q$, $Q \to R$

$$\dfrac{\dfrac{}{P \to Q}\,(\text{PQ}) \qquad \dfrac{}{Q \to R}\,(\text{QR})}{P \to R}\,(\text{Deduction})$$

Forward Chaining

Premises

↓

Conclusions

Premises: P, $P \to Q$, $Q \to R$

$$\dfrac{\dfrac{\dfrac{}{P}\,(\mathrm{P}) \quad \dfrac{}{P \to Q}\,(\mathrm{PQ})}{P \to R}\,(\text{Deduction}) \quad \dfrac{}{Q \to R}\,(\mathrm{QR})}{R}\,(\text{Modus Ponens})$$

$$\vdots$$

Backward Chaining

Conclusion: R

Premises

Conclusions

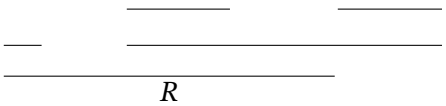
Backward Chaining

Premises

↑

Conclusions

Conclusion: R



Backward Chaining

Premises

↑

Conclusions

Conclusion: R

$$\dfrac{\dfrac{}{P}\,(\mathrm{P}) \qquad \dfrac{}{P \to R}}{R}\,(\text{Modus Ponens})$$

Backward Chaining

Premises

↑

Conclusions

Conclusion: R

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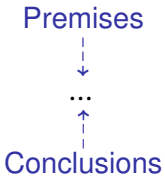
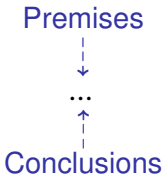
Inward Chaining



Premises: P, $P \to Q$, $Q \to R$, Conclusion: R

Inward Chaining



Premises: P, $P \to Q$, $Q \to R$, Conclusion: R

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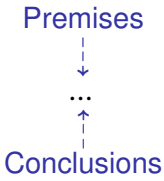
Inward Chaining



Premises: P, $P \to Q$, $Q \to R$, Conclusion: R

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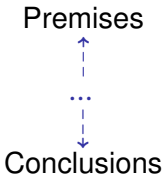
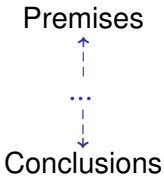
Outward Chaining



Premise: P, Lemma: $P \rightarrow R$

Outward Chaining



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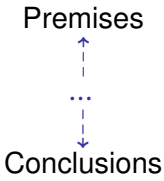
Outward Chaining



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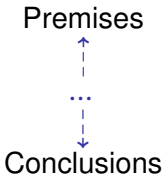

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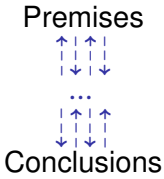
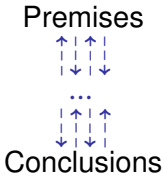
Omniward Chaining



Premise: $Q \to R$, Lemma: $P \to R$

Omniward Chaining



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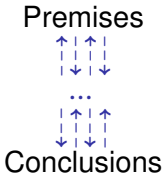
Omniward Chaining



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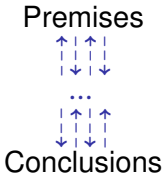
Omniward Chaining



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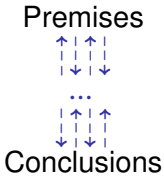

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