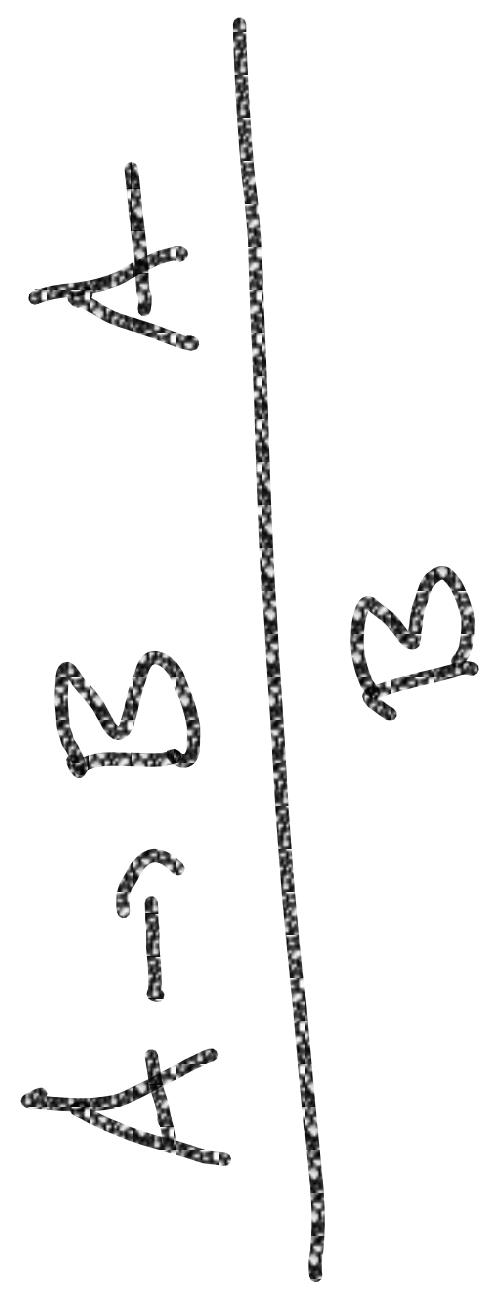


Modus Ponens



Prädikat Variablen f.:

$$a \leftarrow b$$



Auswurtschreiber: $\Sigma a, b \exists$ ist die einzige Ausdruckswerte von

Modus Ponens Theorie $\Sigma a, a \rightarrow b \exists$ für klassische Al:

$$\begin{cases} \Sigma a, b \exists, \{a, b, c\}, \dots, \{a, b, c, d, e, \dots\} \\ \Sigma a, b \exists, \{a, b, c\}, \dots, \{a, b, c, d, e, \dots\} \end{cases}$$

↑

wi. $\{a, b, c, \dots\} \rightarrow B$ w. $b = \text{True}$
 $w. a = \text{True}$

$w. x = \text{False}$

Wissenswertes:
Abstrakte Semantik

$$\text{Var} = \{x_1, x_2, \dots\}$$

$$\text{Operatoren} = \{\wedge, \vee, \neg\}$$

$$CP = \text{Unterprogramm} = \text{Var} \rightarrow B$$

Formeln:

Data \vdash whenever

$y :: \text{Var} \vdash \top$

$\vdash \bot$

$\vdash t \neq t$

$\vdash t = t$

$\vdash t \in F$

$\vdash t \in T$

$$\begin{array}{lcl} \text{Var} & : & B \hookrightarrow B \rightarrow B \\ \wedge_B & : & B \rightarrow B \rightarrow B \\ \neg_B & : & B \rightarrow B \rightarrow B \\ \vee_B & : & B \rightarrow B \rightarrow B \\ \top_B & : & B \rightarrow B \end{array}$$

eval : $P \rightarrow F \rightarrow B$

eval & $(\text{Var } x) = f x$

eval & $(A \wedge B) =$

$(\text{eval } A) \wedge_B (\text{eval } B)$

eval & $(A \vee B) =$

$(\text{eval } A) \vee_B (\text{eval } B)$

eval & $(\neg A) = \neg_B (\text{eval } A)$

Wichtig: Abzählbare Mengen bzgl. der:

$$\text{Var} = \{x_1, x_2, \dots\}$$

$$\text{Operatoren} = \{\wedge, \vee, \neg\}$$

$$(\lambda P \rightarrow Q) \rho P : Q$$

$$\text{data } T \text{ where eval : } IP \rightarrow F \rightarrow B$$

$$v : \text{Var} \rightarrow T$$

$$\wedge : T \rightarrow T \rightarrow T$$

$$\vee : T \rightarrow T \rightarrow T$$

$$\neg : T \rightarrow T$$

$$\text{eval } f (v x) = f x$$

$$\text{eval } f (A \wedge B) =$$

$$(\text{eval } f A) \wedge_B (\text{eval } f B)$$

$$\text{eval } f (A \vee B) =$$

$$(\text{eval } f A) \vee_B (\text{eval } f B)$$

$$\text{eval } f (\neg A) = \neg_B (\text{eval } f A)$$

$$\neg_B : T \rightarrow T$$

$$\neg : T \rightarrow T$$

$$\neg : T \rightarrow T$$

: Type

Unter Verwendung von:

$$\wedge_B : B \rightarrow B \rightarrow B$$

$$\vee_B : B \rightarrow B \rightarrow B$$

$$\neg_B : B \rightarrow B$$

$$\text{eval } f (v x) = f x$$

$$\text{eval } f (A \wedge B) =$$

$$(\text{eval } f A) \wedge_B (\text{eval } f B)$$

$$\text{eval } f (A \vee B) =$$

$$(\text{eval } f A) \vee_B (\text{eval } f B)$$

$$\text{eval } f (\neg A) = \neg_B (\text{eval } f A)$$

$$\neg_B : T \rightarrow T$$

$$\neg : T \rightarrow T$$

$M : IP$ ist ein Modell einer Theorie \mathcal{L} : $\mathcal{L} \vdash \phi$

$$\forall f : T \rightarrow T . \quad f \in \mathcal{L} \rightarrow \mathcal{L}$$

$$\forall f : T \rightarrow T . \quad \text{eval}_M f = \text{eval}_B f = \text{True}$$

Alternativ: Cuiuslibet ϕ soll:

Modellrelation:

$$\mathcal{L} : \mathcal{L} \rightarrow IP \rightarrow \text{Type}$$

$$\mathcal{L} : \mathcal{L} \rightarrow \prod_{f : T} \text{eval}_M f = \text{eval}_B f = \text{True}$$

$$\neg : IP \rightarrow T \rightarrow \text{Type}$$

$$\neg : T \rightarrow \text{Type}$$

Theorie:

$$T = \text{List } F$$

Modell:

$$M : T \rightarrow \text{Type}$$

$$\mathcal{L} : \mathcal{L} \rightarrow T \rightarrow \text{Type}$$

25.05.

Worongy generation!

is there equivalence to formula?

$$Y \leftarrow X$$

Classically: $(x \rightarrow y) \leftrightarrow (\forall x)(\neg x \vee y)$ is a tautology.

$$\vdash (\forall x)(\neg x \vee y)$$

$$\text{we have } \vdash f = g$$

$$m \vdash [f] = g : \text{Type}$$

$$\vdash m \vdash [f] = g : \text{Type} \quad \text{eval in } g = \text{True}$$

with quote of substitution (single formula on the right):
 $\vdash f = g = \text{eval in } f \vdash \text{True}$

quotation abuse of notation: f is a "whole log" if every $m : \text{Type}$ is a model of f :

$\vdash f = g = \text{eval in } f \vdash \text{True}$

$$\frac{\vdash f = g : \text{Type}}{\vdash f = g}$$

↳ which genre?
"equivalent"?

| Defined semantically,
i.e. via (Color-Sizes-)models

| i.e. the type family
 $\mathcal{M}R((x,y) \in (x,y))$
has a "section":

| $: \text{Prop} \rightarrow \text{Type}$

| ↳

| ↳

| ↳

| ↳

| ↳

$\exists x \forall y (x > y) \leftrightarrow (\exists x \forall y)$
 $\exists f \forall g (f > g) \leftrightarrow \perp$

"Beweisbarkeit ist reflektiv"

Provability: formula is provable
 $\vdash f \leftrightarrow \perp$ without any assumptions?

of classical propositional logic

Complex terms }
Soundness

$\vdash f$

Localization of formulas "packing":

$a \rightarrow b \quad a \rightarrow c \wedge d$
 $\exists x \varphi \quad \exists y \varphi$

is strongly equivalent to

$a \wedge (\exists x \varphi) \leftrightarrow b \wedge (\exists y \varphi)$
 $C_1 \quad C_2$

$a \wedge (\exists x \varphi) \leftrightarrow b \wedge (\exists y \varphi)$ also equivalent to
 $a_1(\varphi_p) \leftrightarrow b_1(\varphi_p)$ with context. e.g.
 $a_1(\varphi_p) \leftrightarrow b_1(\varphi_p)$ if $a_1(\varphi_p) \rightarrow b_1(\varphi_p)$

Let A, B be sets of logic programs to test
for equivalence.

A is strongly equivalent to B

\Leftrightarrow \exists C (Set of rules)
(C , belief, proposal theories)
 $A \cup C$ is equinatural to B

$A \cup C$ has the same answer sets as

$B \cup C$

$p \in O = \Sigma_{\text{of } A, B} \cap$
is an aggregate

It is an abbreviation for

$p \leftarrow T \wedge A \wedge T$ $p \leftarrow T \wedge B \wedge T$
 ~~$p \leftarrow T \wedge A \wedge T$~~

$$\begin{array}{c} p \leftarrow r \cap q \wedge r \\ p \leftarrow q \vee r \\ p \leftarrow "(\exists x)(x \in r) \wedge \\ p \leftarrow \end{array}$$

Equivalence of C3) and C4)
is at least plausible

1.6. originally: 30th (Gelfond, Lifschitz) ... several weakenings
 As (categorial) propositional formulae:

$p \leftarrow r \cap q \wedge r$	$\vdash p \rightarrow (r \rightarrow q)$	$\vdash p \rightarrow r \wedge q$	$\vdash p \rightarrow r \wedge (q \wedge r)$	$\vdash p \rightarrow r \wedge (q \wedge r)$
$p \leftarrow q \vee r$	$\vdash p \rightarrow (\neg q \rightarrow r)$	$\vdash p \rightarrow r \vee q$	$\vdash p \rightarrow r \vee (q \vee r)$	$\vdash p \rightarrow r \vee (q \vee r)$
$p \leftarrow "(\exists x)(x \in r) \wedge$	$\vdash p \rightarrow \exists x(x \in r)$	$\vdash p \rightarrow \exists x(x \in r)$	$\vdash p \rightarrow \exists x(x \in r)$	$\vdash p \rightarrow \exists x(x \in r)$
$p \leftarrow \perp$	$\vdash p \rightarrow \perp$	$\vdash p \rightarrow \perp$	$\vdash p \rightarrow \perp$	$\vdash p \rightarrow \perp$

claims: These are strongly equivalent.

out of also

$$\neg(p \rightarrow q) \vee \neg$$

by $\neg \vdash q$

$$\neg p, \neg r \vdash \neg p$$

"wantless" is proved in two ways

(1) with synth. dec. + transf.

(2) direct from counter model.

(2) Shows that there is no classical logic
in analogy to C LF trans from

(1') with synth. dec. transf.

(2') showing from C LF models (classical)

multiple predictions

$(x_i, y) \in$

$f: \mathbb{Z} \rightarrow B$ w.r.t.

\mathcal{P}

one possible y

x

$\begin{cases} \text{true if } p \in X \\ \text{false if } p \notin Y \\ \text{undecided otherwise} \end{cases}$

Or $(x_i, y) \in$

$f: \mathbb{Z} \rightarrow \text{Maybe } B$

$\begin{cases} \text{Just } y \\ \text{Nothing} \end{cases}$

x

$\begin{cases} \text{Just } y \\ \text{Nothing} \end{cases}$

$\begin{cases} \text{true if } p \in X \\ \text{false if } p \notin Y \\ \text{Nothing otherwise} \end{cases}$

x

for Maybe $M \rightarrow M$ where

$\exists y$

$\text{Just } y$

x

$\begin{cases} \text{Haskell } A \\ \text{Haskell } A \end{cases}$

$\exists y$

$\text{Haskell } A$

x

$\begin{cases} \text{Haskell } A \\ \text{Haskell } A \end{cases}$

$\begin{cases} \text{Just } y \\ \text{Nothing} \end{cases}$

x

$\forall x \exists y \forall z$

$(x, y) \models \text{Hilfssatz}$

! decke "

$(y, z) \models \text{Hilfssatz}$

allerdings
 $\vdash \neg \text{Hilfssatz}$

$(x, y) \models \text{Hilfssatz}$

$\models (x, y) \models \phi$

$\models (x, y) \models \psi$

$\models (x, y) \models \chi$

$\models (x, y) \models \psi$

$\models (x, y) \models \chi$

$\models (x, y) \models \psi$

$\models (x, y) \models \phi$

$\models (x, y) \models \chi$

ausreichend?

$x \models \alpha$

$x \models \beta$

\vdash

\vdash

\vdash

\vdash

\vdash

\vdash

$\neg \exists x (X_1(x) \neq T \wedge Q \rightarrow Q)$

$\neg \exists x (X_1(x) \neq T \wedge \forall y (X_1(y) \neq T \rightarrow Q))$

$\neg \exists x (X_1(x) \neq T \wedge \forall y (X_1(y) \neq T \rightarrow Q))$
implies $(X_1(y) \neq T \rightarrow Q)$

we take again ..

$(X_1(x) \neq T \wedge Q \rightarrow Q)$

$(X_1(x) \neq T \wedge Q \rightarrow Q)$

or

$\neg \exists x (X_1(x) \neq T \wedge Q \rightarrow Q)$
implies $(X_1(x) \neq T \rightarrow Q)$

$\neg \exists x$

$\neg \exists x (X_1(x) \neq T \wedge Q \rightarrow Q)$
implies $(X_1(x) \neq T \rightarrow Q)$

$\neg \exists x$

From 2 #
 $\neg \exists x (X_1(x) \neq T \rightarrow Q)$
 $\neg \exists x (X_1(x) \neq T \rightarrow Q)$
 $\neg \exists x (X_1(x) \neq T \rightarrow Q)$

(3)

$\neg (x_1, y) \neq y$ or $(x_1, y) \neq z$

$\neg (x_1, y) \neq y \wedge (x_1, y) \neq z$

$\neg ((x_1, y) \neq y \text{ or } (x_1, y) \neq z)$ or $(x_1, y) \neq z$

Zusammenfassung: D.h. d.h. heterologe als klassisch
unterscheiden - so liefert $\neg \exists x \forall y$ eine
klassische Logik

N.B. $\neg \exists x \forall y$ ist auch in multiwertiger Logik
gültig und ist mit Klassischer Logik

Prof. 2

zu alle $x \in V$

gilt $(x, y) \in T \Leftrightarrow y \in T_x$

$T_x = \{y \mid$
 \exists $D \ni$

$(x, y) \in D\}$

$(x, y) \in T$ impliziert $(x, y) \in T_x$
und $y \in T_x$

\vdash $\forall x \forall y \forall z$

$(x, y) \in T_x \wedge$
 $(x, z) \in T_x \Rightarrow y = z$

und $y \in T_x$

\therefore

$(x, y) \in T_x \wedge$
 $(x, z) \in T_x \Rightarrow y = z$

$\therefore (x, y) \in T_x \wedge$
 $(x, z) \in T_x \Rightarrow y = z$

$\therefore \forall x \forall y \forall z$

$(y, z) \in T_x \Rightarrow y = z$

“*Wagtail*” *and* *Redwings* *are* *the* *two* *most* *common* *birds* *seen* *in* *the* *area*.
The *Redwings* *are* *seen* *more* *often* *than* *the* *Wagtails*, *but* *both* *are* *seen* *everywhere*.

U.S. Patent and Trademark Office
Reg. No. 304,523
Serial No. 14,
Date of Reg. April 1, 1932.
Name of Inventor: George S. Hodges
Name of Assignee: S. C. Johnson & Son, Inc.
Filed: Sept. 1, 1927.

Auntie Anne's
wings
curly
pretzels
popcorn

14
“
Endless

Axiome
Axiom
Axiome
Axiom
Axiome

The diagram illustrates a DNA double helix structure. The vertical axis represents the backbone, and the horizontal axis represents the phosphate groups. Four segments of the backbone are labeled: 'A' at the bottom left, 'B' at the top left, 'C' at the top right, and 'D' at the bottom right. Each segment is composed of a series of small, dark, irregular shapes representing individual nucleotides.

A vertical column of five stylized, abstract symbols resembling stylized Arabic script or knotwork, rendered in black and white.

وَمِنْهُمْ مَنْ يَعْمَلُ
كُلَّ كُفْرٍ وَمَا يَنْهَا

The image consists of five black and white photographs arranged vertically, illustrating the life cycle of a caterpillar. The top photograph shows a caterpillar with a distinct segmented body and prolegs. The second photograph shows the caterpillar beginning to curl its body. The third photograph shows the caterpillar curled into a more compact, C-shaped form. The fourth photograph shows the caterpillar curled into a tight, circular chrysalis. The bottom photograph shows the completed chrysalis, which is a dark, textured, and somewhat irregular shape.

14

wollen in fröhlichem Geschreie:

7779 → 780

Kewei's Series 779 und 780 aus
einem früheren dritten zu einem Wiederauflage.
Aus der ersten Ausgabe sind nur
 $A \rightarrow (K \rightarrow H) \rightarrow T$
 $(A \cdot K \cdot H \cdot T \cdot a)$ erhalten worden.
Aus 779 und 780 enthalten wiederum
geforderte Wiederauflage.

$$(5) \quad F \cup (F \cap G) \cup F \cap G$$

$$(D \cap H) \quad \cap (CF \cap G) \rightarrow F \cup F \cap G$$

Wollen wir ja: $(5) \rightarrow (D \cap H)$.

Seien $U(5) = F \cup (F \cap G)$ aufgezählt.
 $A(F \cup F \cap G)$ für Zeigt
 $\cap F$ nicht ist F .
 Dann gilt nur $F \cap G$. Dafür gilt
 $G \cap G = \emptyset$ und für
 $(CF \cap G)$.

3. $\neg G$ gilt.

2. $F \neg G$ gilt.
 Hier zeigt $\neg F$. Sei dafür F
 ausgenommen. $\neg F$ ist
 wahr. Also durch $F \cap G$.
 Widerspruch. Also F und $F \neg G$

Agnis alder von

Fu G und

?

$$((\bar{F}, \bar{G}) \cap G) \cup ((\bar{G} \cap F) \cup (\bar{E}))$$

Zumindest \bar{F} ist klar: 2 symmetrische Fälle:

i. \bar{F} gleich oder $\neq G$ gleich.

$$\text{Dann } \bar{G} = (\bar{G} \cap F) \cup (\bar{E})$$

d. h.:

Sei $C(\bar{F} \cap G)$ offen dann ist \bar{F} und \bar{G} offen sowie $\bar{G} \cap F$ offen.
Für \bar{F} ist \bar{G} offen und $\bar{G} \cap F$ offen. $\bar{G} \cap F$ ist offen und $\bar{G} \cap F$ offen.

für \bar{G} ist \bar{F} offen und $\bar{F} \cap G$ offen. $\bar{F} \cap G$ ist offen und \bar{F} offen.

Ukaszwickz ($\lambda g x$) schaut

Beschränkung von:

- ↳ Programm couplettes "give" leichter
- ↳ Tweak für Definitionen auf einer Skalare

Beschränkung Themen:

Berechnung Global Kons.

Was ist $\forall t \models T \wedge A[X \simeq Y]$?

Aber wie viele Definitionen für ein Answer Set?

$$(X \models T)$$

22.06.

Seien $\overline{I}_1, \overline{I}_2$ Theorien . \overline{I}_1 und \overline{I}_2 sind äquivalent \Leftrightarrow

Logik "Here and There" def

Seien $\overline{I}_1, \overline{I}_2$ Theorien . \overline{I}_1 und \overline{I}_2 sind äquivalent \Leftrightarrow

$$(A) \quad \forall (x, y) (x, y) \in \overline{I}_1 \Leftrightarrow (x, y) \in \overline{I}_2$$

(B) $\exists x \exists y \exists z$ $x \neq y \wedge x \neq z \wedge y \neq z \wedge \forall t (t \neq x \vee t \neq y \vee t \neq z)$ gilt

aus \overline{I}_1 und aus \overline{I}_2

aus \overline{I}_1 und aus \overline{I}_2 nicht die selben erfüllen

(A) \Rightarrow (B) Sei \forall eine aus \overline{I}_1 sekt von \overline{I}_2

(B) \Rightarrow (A) und $\exists x \exists y \exists z$ $x \neq y \wedge x \neq z \wedge y \neq z \wedge \forall t (t \neq x \vee t \neq y \vee t \neq z)$ gilt

The image consists of a vertical column of six distinct, abstract shapes, each composed of a series of black and white checkered segments. The shapes are arranged vertically from top to bottom. The first shape is a horizontal line with a slight curve and a small loop at the end. The second shape is a vertical line with a small loop at the top. The third shape is a cross-like structure with curved ends. The fourth shape is a horizontal line with a large, complex loop in the middle. The fifth shape is a vertical line with a large, complex loop at the bottom. The sixth shape is a vertical line with a small loop at the top and a larger loop at the bottom.

The image displays a vertical column of six separate diagrams, each composed of several black sticks with white checkered patterns. The configurations include: 1) Three parallel horizontal sticks. 2) Two parallel horizontal sticks with a single vertical stick between them. 3) A large 'X' shape formed by four sticks. 4) A complex, multi-layered structure where several sticks are intertwined and looped over each other. 5) Two parallel horizontal sticks with a single vertical stick between them, similar to the second diagram but with a different orientation. 6) A structure resembling a stylized 'M' or a hand with fingers, formed by multiple sticks.

A vertical column of six handwritten numbers from 1 to 6, each with a unique decorative style. The numbers are:

- 1: A simple horizontal stroke with a small dot at the top.
- 2: A horizontal stroke with a small loop at the end.
- 3: A horizontal stroke with a large, prominent loop.
- 4: A horizontal stroke with a small loop at the end and a small dot above it.
- 5: A horizontal stroke with a small loop at the end and a small dot above it.
- 6: A horizontal stroke with a small loop at the end and a small dot above it.

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100

The image shows a single page from a spiral-bound notebook. The paper is off-white with a subtle texture. Handwritten text in black ink is written in a cursive script. The text is organized into several lines, with some words appearing more than once. The handwriting is fluid and expressive. There are no other markings or drawings on the page.

Lernzettel

$\forall F, G, K$

$$(G \rightarrow F) \rightarrow (K \rightarrow F)$$

$$\begin{aligned} & (F \vee G) \rightarrow (K \vee G) \\ & K \vee F \vee G \end{aligned}$$

Prof. Siehr Antike ist nicht definiert und gilt
Verständlich.

Umkehr \wedge Punkt:

$$Sachverhalt$$

Sie $\vdash \{ \text{sie liest } T \}$

für eine (richtig verstandene)
erdeiche, lede unreg-

g. 2. 2. 4. $\vdash 3 \overline{\Pi}_k \cdot \Xi^{\overline{\Pi}_k}$ - denn der neue wäre

π_{in}

and equivalent

π_{out}

۱ ۲ ۳ ۴ ۵ ۶ ۷ ۸ ۹ ۰

equivalent to
the instance
in stage 3.
This
is
an
example
of
a
cyclic sieving
phenomenon.

A vertical column of 20 hand-drawn, abstract symbols or initials, each consisting of a series of short, dark, wavy lines forming loops and curves. The symbols are arranged vertically from top to bottom.