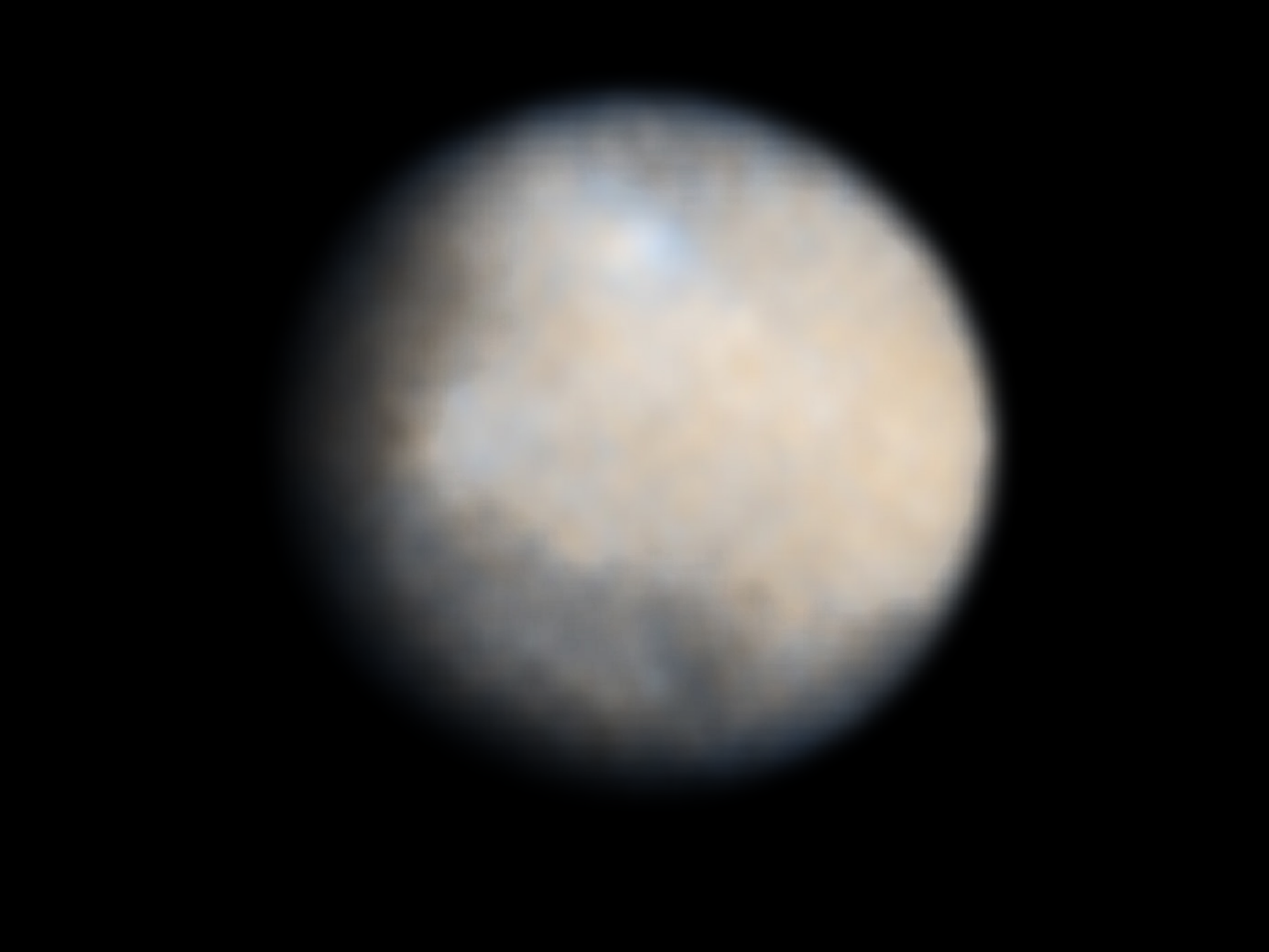
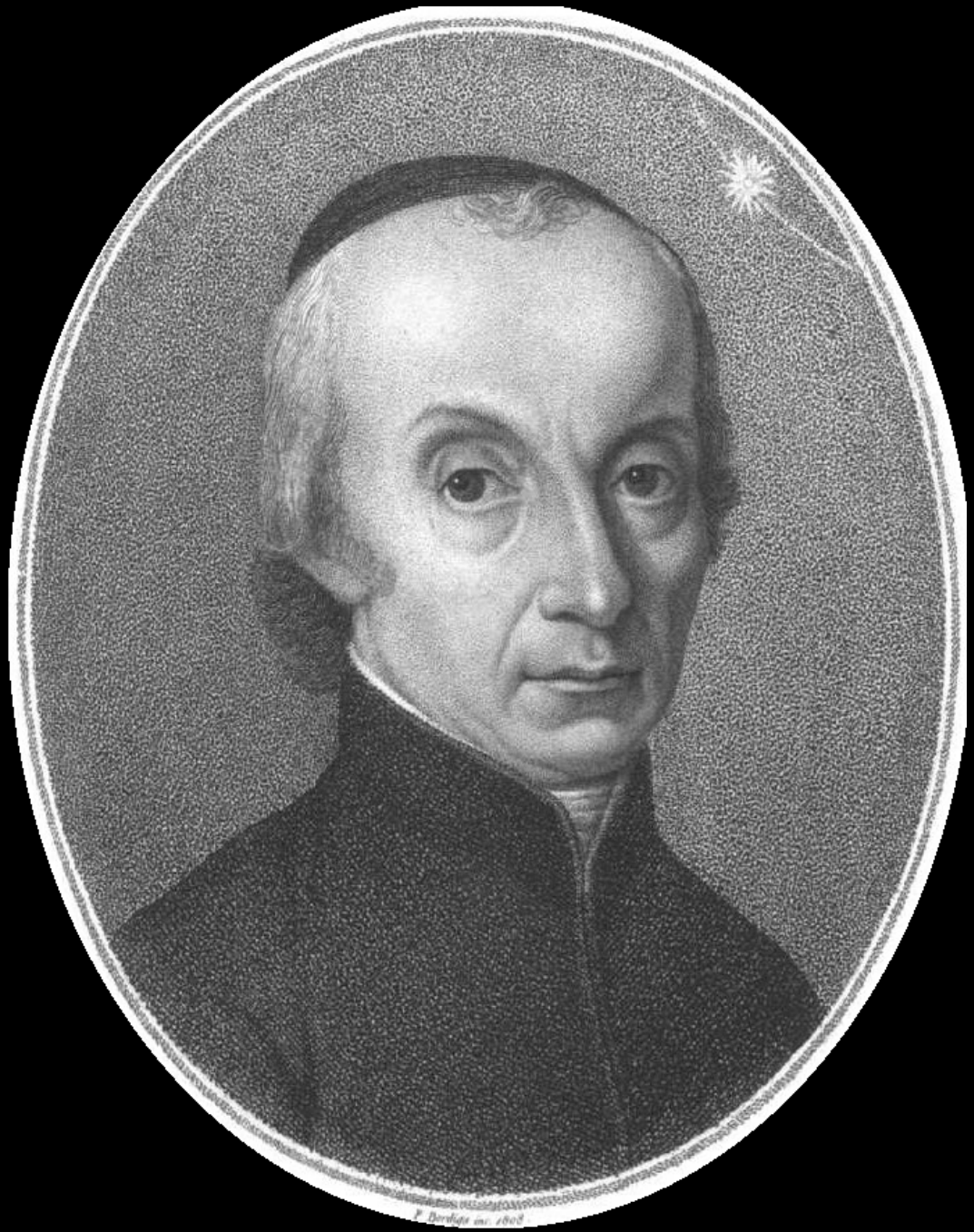
Life, the Universe and ...

... Machine Learning




P. Bordiga inc. 1808

Beobachtungen des zu Palermo d. 1. Jan. 1801 von Prof. *Piazzi* neu entdeckten Gestirns.

1801	Mittlere Sonnen-Zeit	Gerade Aufsteig. in Zeit	Gerade Aufsteigung in Graden	Nördl. Abweich.	Geocentrische Länge	Geocentr. Breite	Ort der Sonne + 20″ Aberration	Logar. d. Distanz ☉ ♂
	St ′ ″	St ′ ″	° ′ ″	° ′ ″	Z ° ′ ″	° ′ ″	Z ° ′ ″	
Jan. 1	8 43 17,8	3 27 11,25	51 47 48,8	15 37 43,5	1 23 22 58,3	3 6 42,1	9 11 1 30,9	9,9926156
2	8 39 14,6	3 26 53,85	51 43 27,8	15 41 5,5	1 23 19 44,3	3 2 24,9	9 12 2 28,6	9,9926317
3	8 34 53,3	3 26 38,4::	51 39 36,0	15 44 31,6	1 23 16 58,6	2 58 9,9	9 13 3 26,6	9,9926324
4	8 30 42,1	3 26 23,16	51 35 47,3	15 47 57,6	1 23 14 15,5	2 53 55,6	9 14 4 24,9	9,9926418
10	8 6 15,8	3 25 32,1::	51 23 1,5	16 10 32,0	1 23 7 59,1	2 29 0,6	9 20 10 17,5	9,9927641
11	8 2 17,5	3 25 29,73	51 22 26,0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
13	7 54 26,2	3 25 30,30	51 22 34,5	16 22 49,5	1 23 10 37,6	2 16 59,7	9 23 12 13,8	9,9928490
14	7 50 31,7	3 25 31,72	51 22 55,8	16 27 5,7	1 23 12 1,2	2 12 56,7	9 24 14 13,5	9,9928809
17	. . . . .	. . . . .	. . . . .	16 40 13,0	. . . . .	. . . . .	. . . . .	. . . . .
18	7 35 11,3	3 25 55,::	51 28 45,0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
19	7 31 28,5	3 26 8,15	51 32 2,3	16 49 16,1	1 23 25 59,2	1 53 38,2	9 29 19 53,8	9,9930607
21	7 24 2,7	3 26 34,27	51 38 34,1	16 58 35,9	1 23 34 21,3	1 46 6,0	10 1 20 40,3	9,9931434
22	7 20 21,7	3 26 49,42	51 42 21,3	17 3 18,5	1 23 39 1,8	1 42 28,1	10 2 21 32,0	9,9931886
23	7 16 43,5	3 27 6,90	51 46 43,5	17 8 5,5	1 23 44 15,7	1 38 52,1	10 3 22 22,7	9,9932348
28	6 58 51,3	3 28 54,53	52 13 38,3	17 32 54,1	1 24 15 15,7	1 21 6,9	10 8 26 20,1	9,9935062
30	6 51 52,9	3 29 48,14	52 27 2,1	17 43 11,0	1 24 30 9,0	1 14 16,0	10 10 27 46,2	9,9936332
31	6 48 26,4	3 30 17,25	52 34 18,8	17 48 21,5	1 24 38 7,3	1 10 54,6	10 11 28 28,5	9,9937007
Febr. 1	6 44 59,9	3 30 47,2::	52 41 48,0	17 53 36,3	1 24 46 19,3	1 7 30,9	10 12 29 9,6	9,9937703
2	6 41 35,8	3 31 19,06	52 49 45,9	17 58 57,5	1 24 54 57,9	1 4 1[illegible],5	10 13 29 49,9	9,9938423
5	6 31 31,5	3 33 2,70	53 15 40,5	18 15 1,0	1 25 22 43,4	0 54 23,9	10 16 31 45,5	9,9940751
8	6 21 39,2	3 34 58,50	53 44 37,5	18 31 23,2	1 25 53 29,5	0 45 5,0	10 19 33 33,3	9,9943276
11	6 11 58,2	3 37 6,54	54 16 38,1	18 47 58,8	1 26 26 40,0	0 36 2,9	10 22 35 13,4	9,9945823

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1801/01/31
1801/02/05
1801/02/08
1801/02/11

hier in der Nähe der Quadratur der Einfluſs der Sonnen-Länge geringer iſt, als in andern Lagen. Dr. *Gauſs* glaubt daher, daſs es nicht undienlich wäre, wenn man die Fehler der Sonnentafeln aus ſehr genauen Beobachtungen für dieſe Zeiten beſtimmte, und die Örter der Sonne hiernach verbeſſerte. Dieſe *vierten* Elemente ſind nun folgende:

Sonnenferne . .	326° 27′ 38″	Hieraus:	
☊	81 0 44	größte Mittelp. Gleichung	9° 27′ 41″
Neigung . .	10 36 57	tägl. mittlere helioc. tropische Beweg.	770,″914
Log. halb. gr. Axe	0,4420527		
Excentricität . .	0,0825017		
Epoche 1800 31 Dec.	77° 36′ 34″		

Aus dieſen Elementen hat Dr. *Gauſs* folgende Örter der *Ceres Ferdinandea* im voraus berechnet. Die Zeit iſt mittlere für Mitternacht in *Palermo*.

1801		Geocentriſche Länge			Geocentriſche Breite nördl.		Logarith. des Abſtandes von der ♁	Logarith. des Abſtandes von der ☉	Verhältniſs der geſehenen Helligk.
		Z	°	′	°	′			
Nov.	25	5	20	16	9	25	0,42181	0,40468	0,6102
Dec.	1	5	22	15	9	48	0,40940	0,40472	0,6459
	7	5	24	7	10	12	0,39643	0,40479	0,6855
	13	5	25	51	10	37	0,38296	0,40488	0,7290
	19	5	27	27	11	4	0,36902	0,40499	0,7770
	25	5	28	53	11	32	0,35468	0,40512	0,8295
	31	6	0	10	12	1	0,34000	0,40528	0,8869

Sollte man den Ort des Planeten nach dieſen Elementen genauer, oder auf eine längere Zeit berechnen wollen: ſo ſetzen wir zu dieſem Behufe noch folgende Formeln hierher:

1) *Zur*

Excentricität [illegible] | Tropische Beweg. [illegible] 770, 914
Epoche 1800 31 Dec. 77° 36′ 34″

Aus diesen Elementen hat Dr. *Gauss* folgende Örter der *Ceres Ferdinandea* im voraus berechnet. Die Zeit ist mittlere für Mitternacht in *Palermo*.

1801	Geocentrische Länge			Geocentrische Breite nördl.		Logarith. des Abstandes von der ♂	Logarith. des Abstandes von der ☉	Verhältniss der gesehenen Helligk.
	Z	°	′	°	′			
Nov. 25	5	20	16	9	25	0, 42181	0, 40468	0, 6102
Dec. 1	5	22	15	9	48	0, 40940	0, 40472	0, 6459
7	5	24	7	10	12	0, 39643	0, 40479	0, 6855
13	5	25	51	10	37	0, 38296	0, 40488	0, 7290
19	5	27	27	11	4	0, 36902	0, 40499	0, 7770
25	5	28	53	11	32	0, 35468	0, 40512	0, 8295
31	6	0	10	12	1	0, 34000	0, 40528	0, 8869

Sollte man den Ort des Planeten nach diesen Elementen genauer, oder auf eine längere Zeit berechnen wollen: so setzen wir zu diesem Behufe noch folgende Formeln hierher:

DELLA SCOPERTA

DEL NUOVO PIANETA

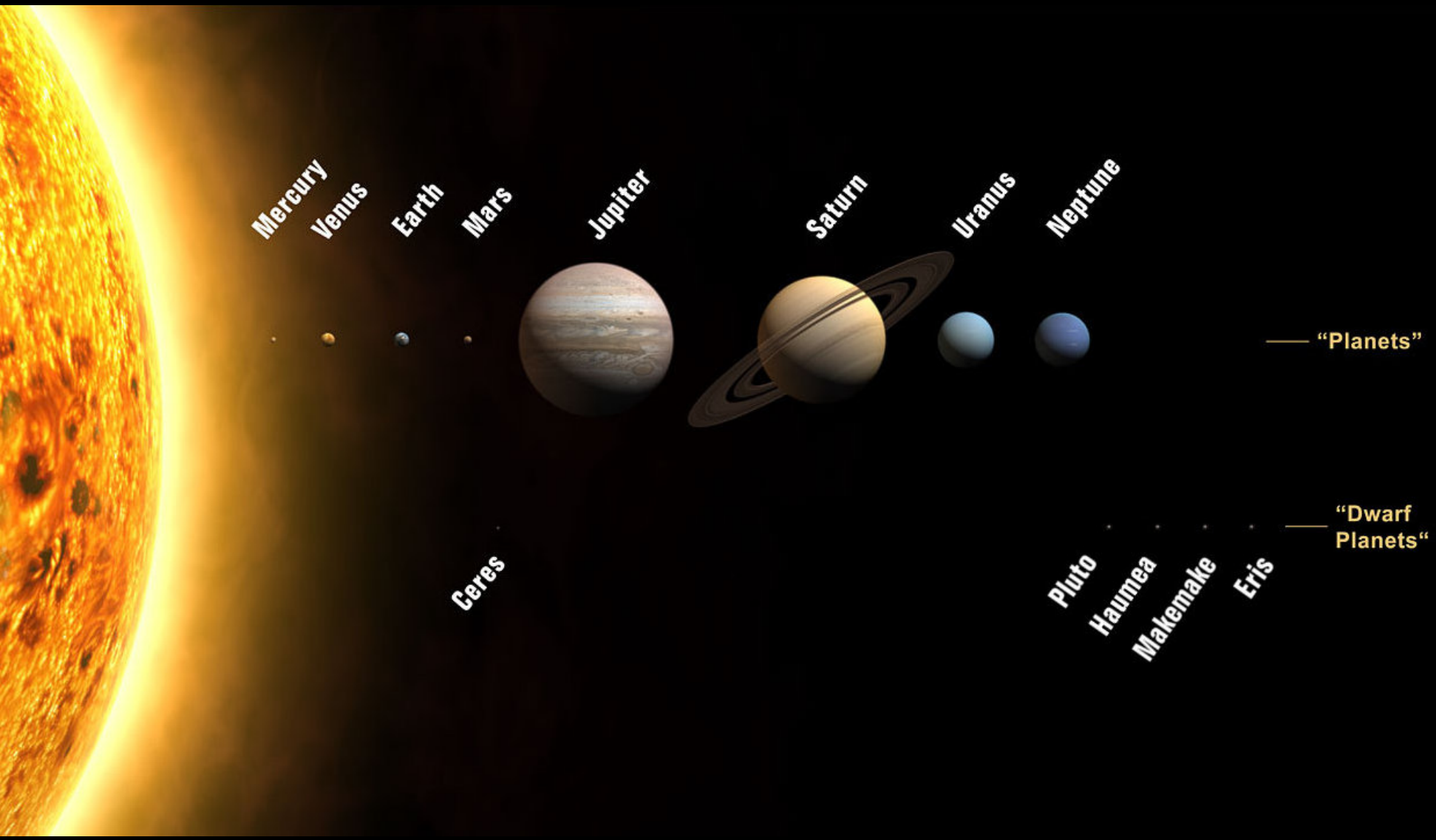
CERERE FERDINANDEA

OTTAVO TRA I PRIMARJ DEL NOSTRO SISTEMA SOLARE.

PALERMO

1802

NELLA STAMPERIA REALE.


Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune
"Planets"
Ceres
Pluto
Haumea
Makemake
Eris
"Dwarf Planets"

other, we say that its choice is an effect without a cause. It is then, says Leibnitz, the blind chance of the Epicureans. The contrary opinion is an illusion of the mind, which, losing sight of the evasive reasons of the choice of the will in indifferent things, believes that choice is determined of itself and without motives.

We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes. The human mind offers, in the perfection which it has been able to give to astronomy, a feeble idea of this intelligence. Its discoveries in mechanics and geometry, added to that of universal gravity, have enabled it to comprehend in the same analytical expressions the past and future states of the system of the world. Applying the same method to some other objects of its knowledge, it has succeeded in referring to general laws observed phenomena and in foreseeing those which given circumstances ought to produce. All these efforts in the search for truth tend to lead it back continually to the vast intelligence which we have just mentioned, but from which it will always remain infinitely removed. This tendency, peculiar to the human race, is that which renders it superior to animals; and their progress

choice is determined of itself and without motives.

We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes.

height: "The day will come when, by study pursued through several ages, the things now concealed will appear with evidence; and posterity will be astonished that truths so clear had escaped us." Clairaut then undertook to submit to analysis the perturbations which the comet had experienced by the action of the two great planets, Jupiter and Saturn; after immense calculations he fixed its next passage at the perihelion toward the beginning of April, 1759, which was actually verified by observation. The regularity which astronomy shows us in the movements of the comets doubtless exists also in all phenomena.

The curve described by a simple molecule of air or vapor is regulated in a manner just as certain as the planetary orbits; the only difference between them is that which comes from our ignorance.

Probability is relative, in part to this ignorance, in part to our knowledge. We know that of three or a greater number of events a single one ought to occur; but nothing induces us to believe that one of them will occur rather than the others. In this state of indecision it is impossible for us to announce their occurrence with certainty. It is, however, probable that one of these events, chosen at will, will not occur because we see several cases equally possible which exclude its occurrence, while only a single one favors it.

The theory of chance consists in reducing all the events of the same kind to a certain number of cases equally possible, that is to say, to such as we may be equally undecided about in regard to their existence, and in determining the number of cases favorable to the event whose probability is sought. The ratio of

shows us in the movements of the comets doubtless exists also in all phenomena.

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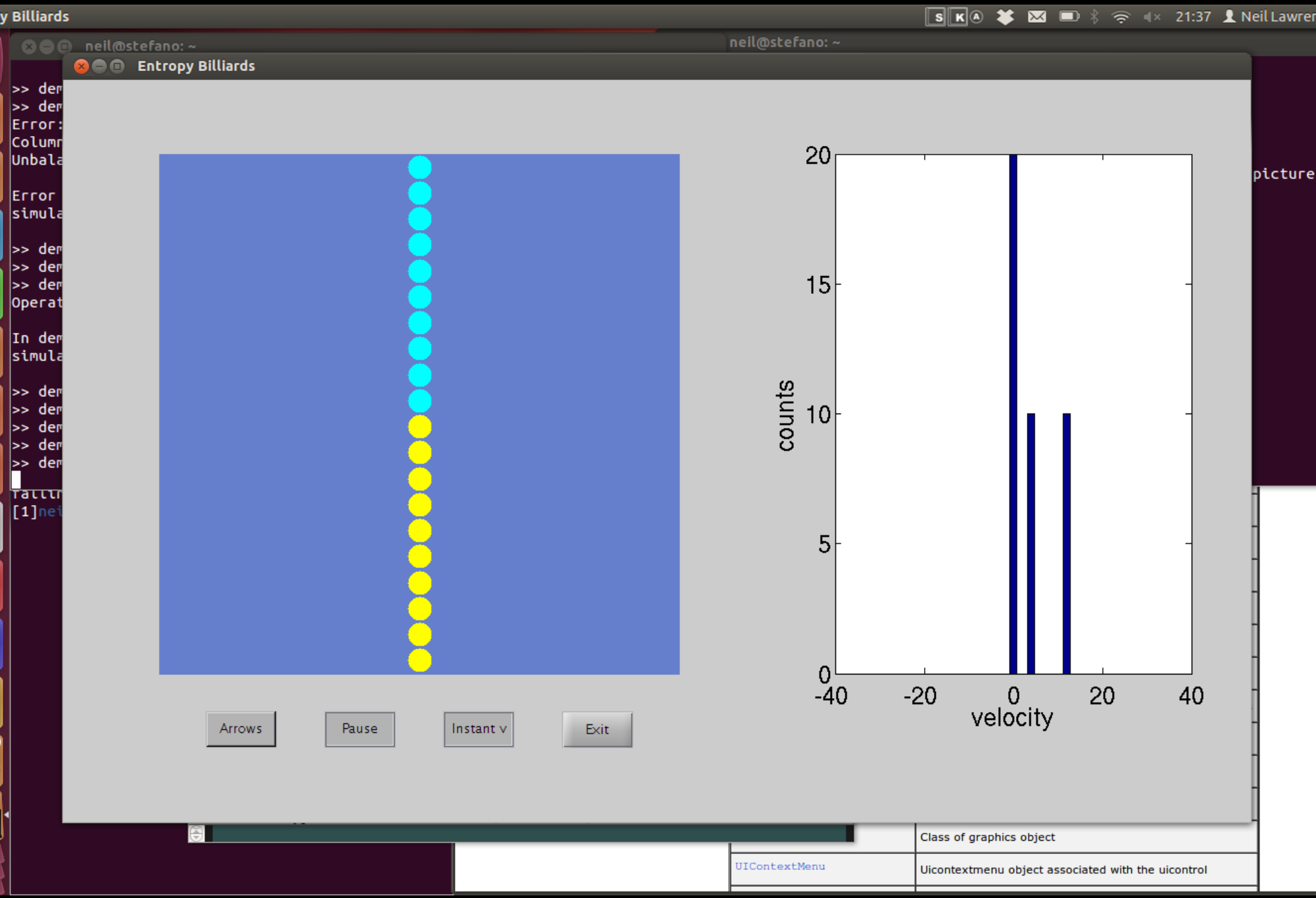
DANIEL BERNOVLLIVS
Med. D. Professor honorarius Academiæ Imper.
Petropolitanæ, Anatomiæ et Botanicæ P.P.O. in
Academiæ Basileensi.
Nat. d. 29. Ian. A.S.R. MDCC.
Dec. III.


Entropy Billiards
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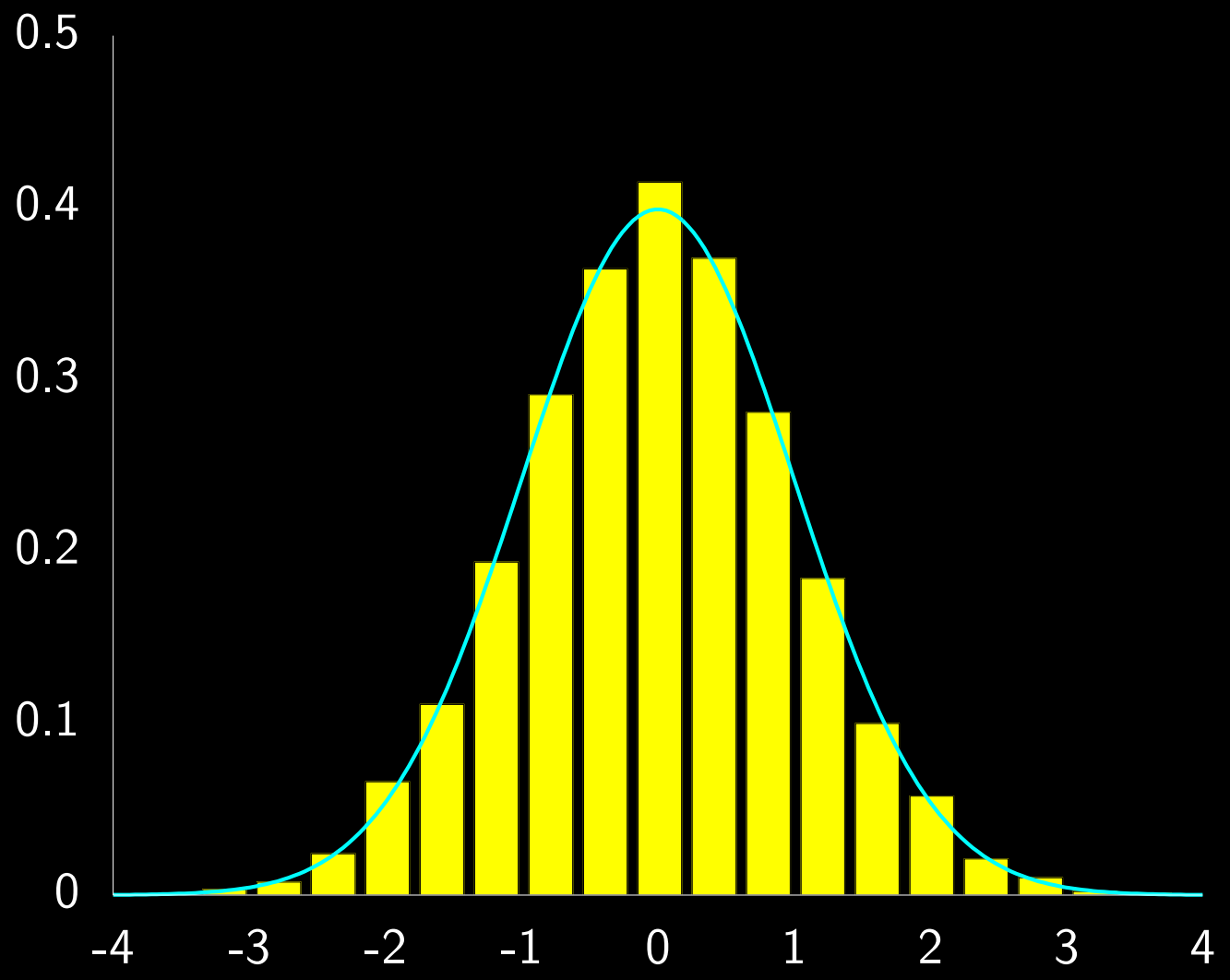
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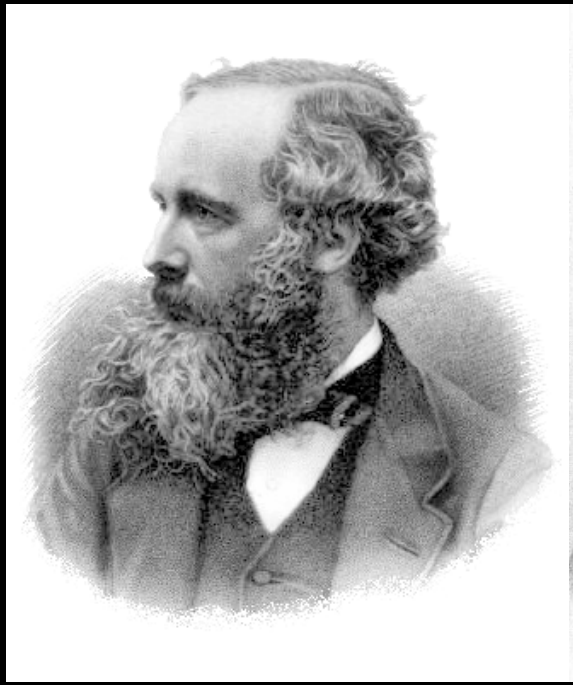

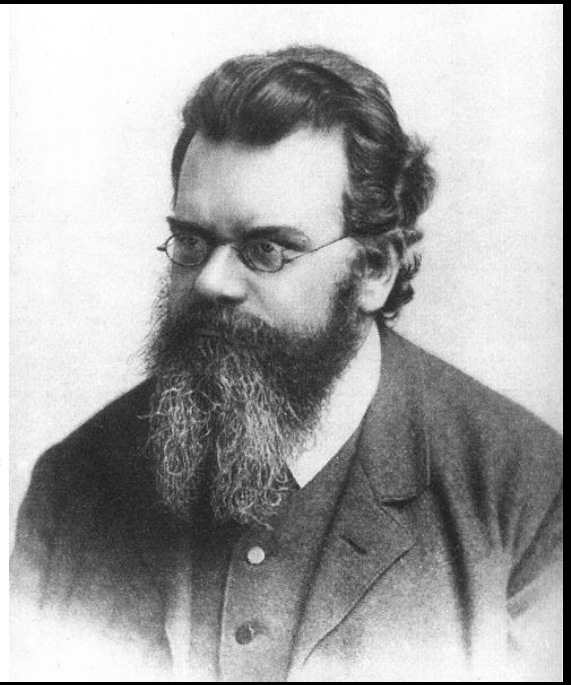

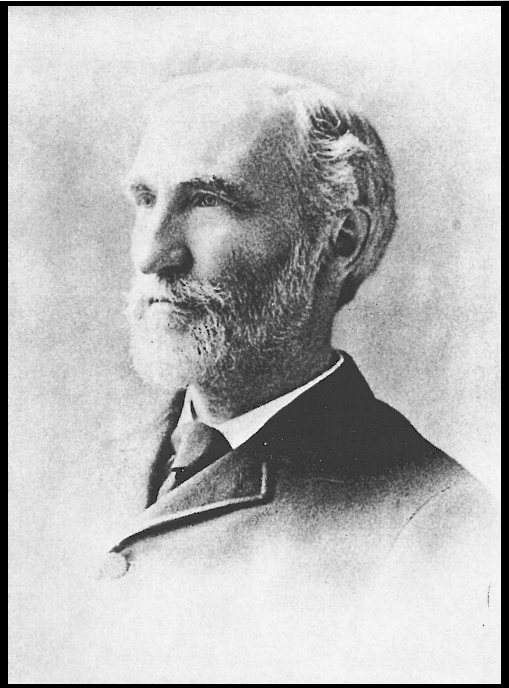

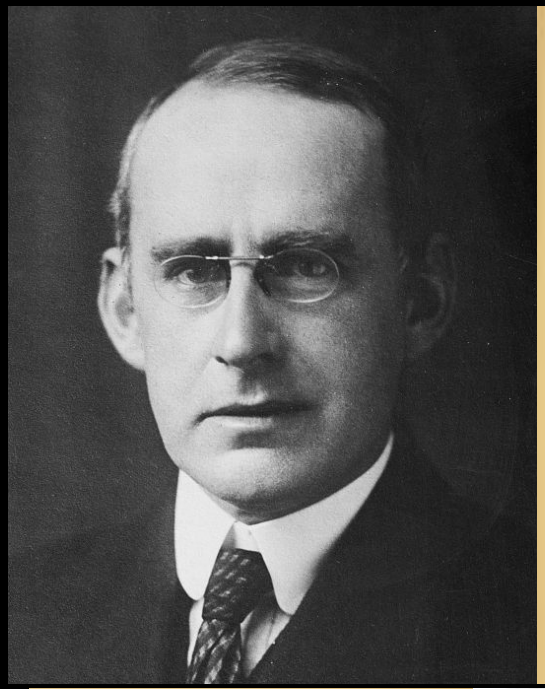

THE NATURE
OF THE
PHYSICAL WORLD

by

A. S. EDDINGTON
M.A., LL.D., D.Sc., F.R.S.
Plumian Professor of Astronomy
in the
University of Cambridge

THE
GIFFORD LECTURES
1927

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1929
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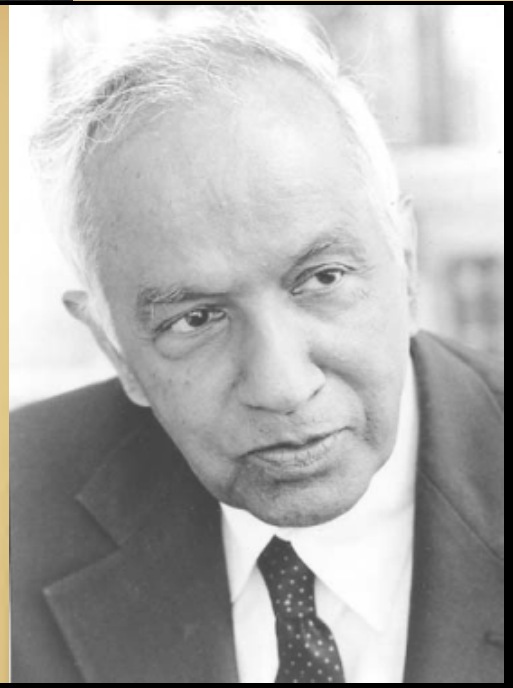
The uniform march of a regiment is not the only form of organised motion; the organised evolutions of a stage chorus have their natural analogue in sound waves. A common measure can now be applied to all forms of organisation. Any loss of organisation is equitably measured by the chance against its recovery by an accidental coincidence. The chance is absurd regarded as a contingency, but it is precise as a measure.

The practical measure of the random element which can increase in the universe but can never decrease is called *entropy*. Measuring by entropy is the same as measuring by the chance explained in the last paragraph, only the unmanageably large numbers are transformed (by a simple formula) into a more convenient scale of reckoning. Entropy continually increases. We can, by isolating parts of the world and postulating rather idealised conditions in our problems, arrest the increase, but we cannot turn it into a decrease. That would involve something much worse than a violation of an ordinary law of Nature, namely, an improbable coincidence. The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation—well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation. This exaltation of the second law is not unreasonable. There are other laws which we have strong reason to believe in, and we feel that a hypothesis which violates them is highly



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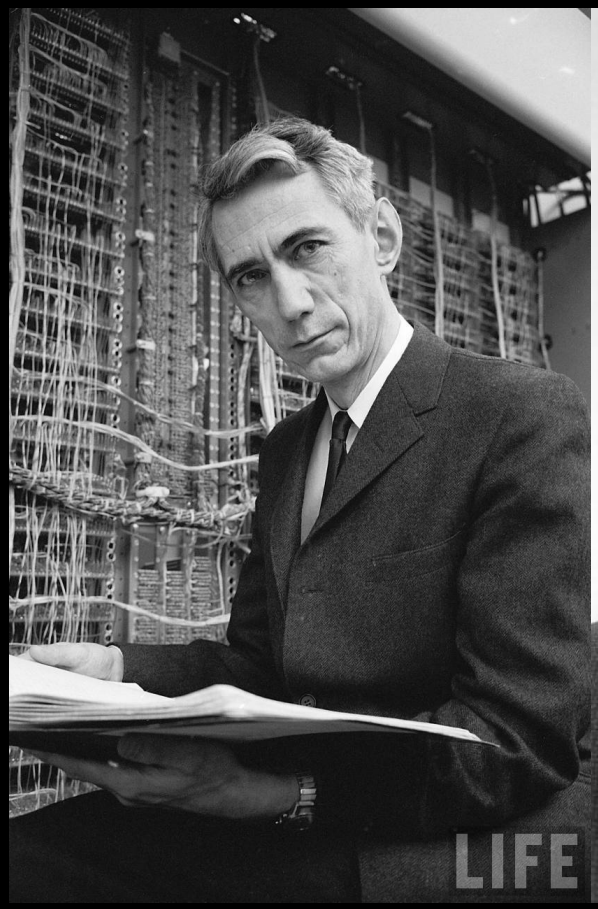
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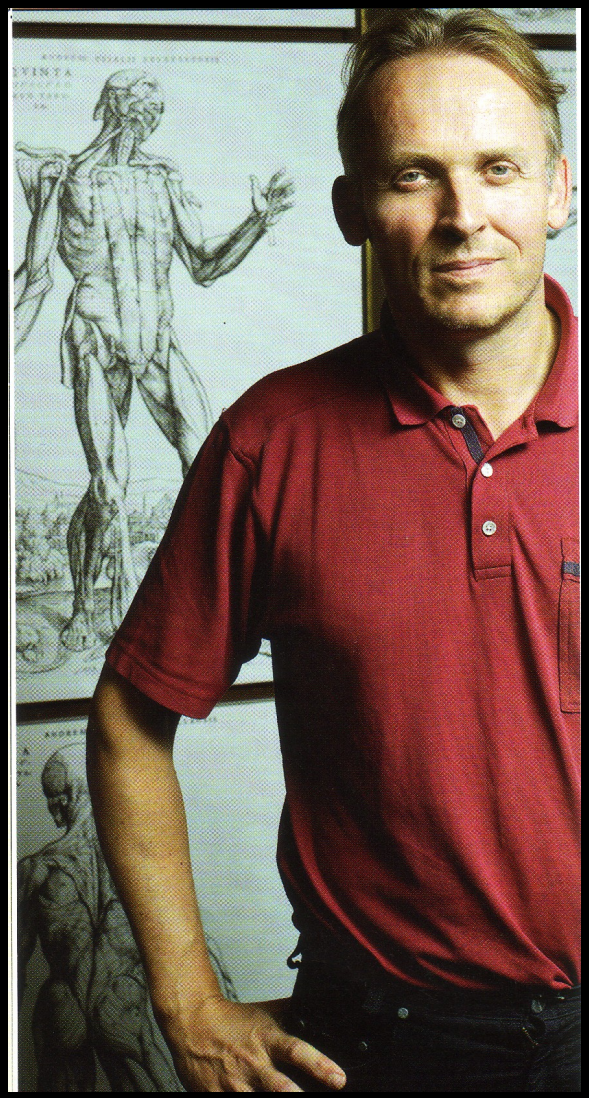

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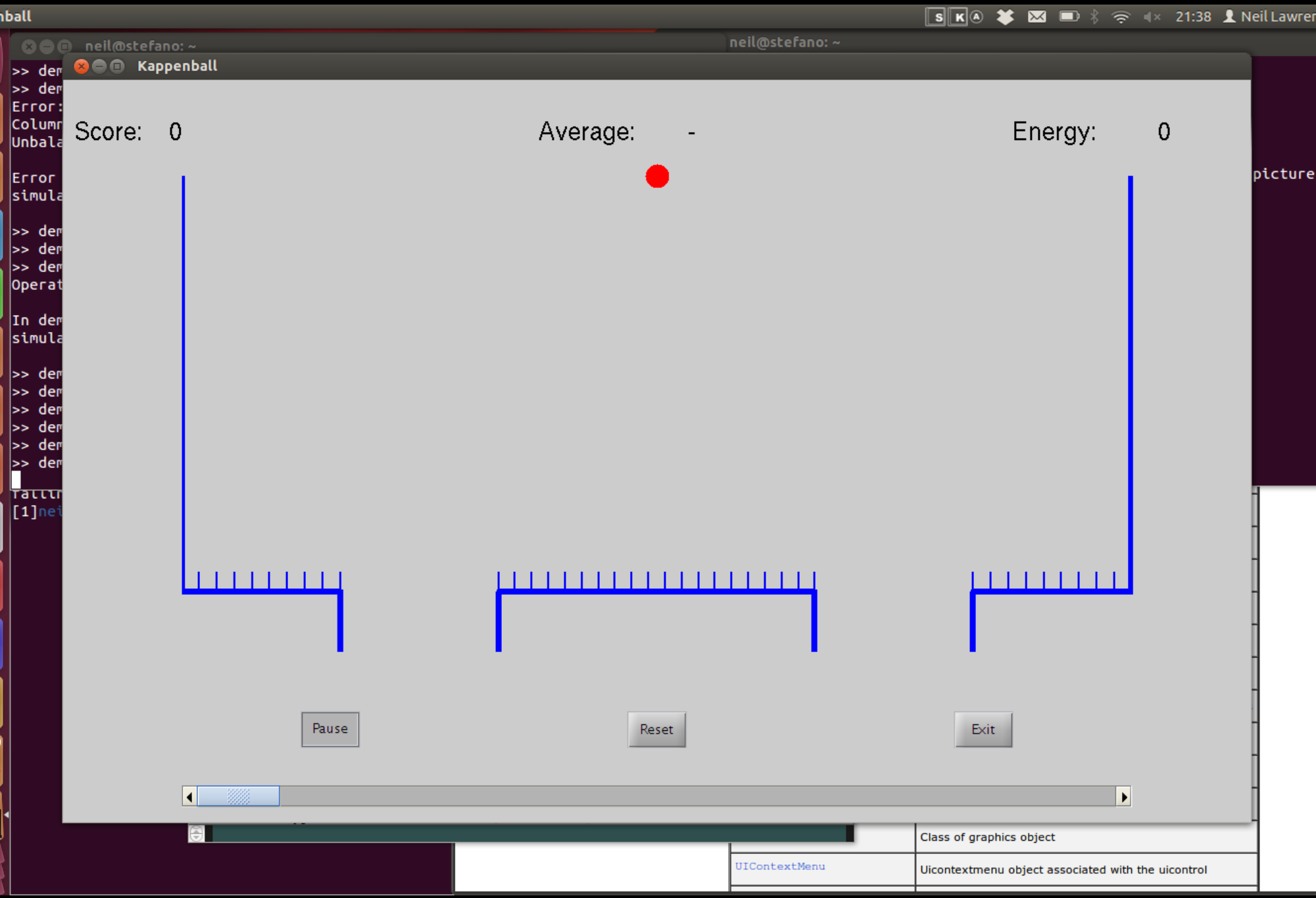
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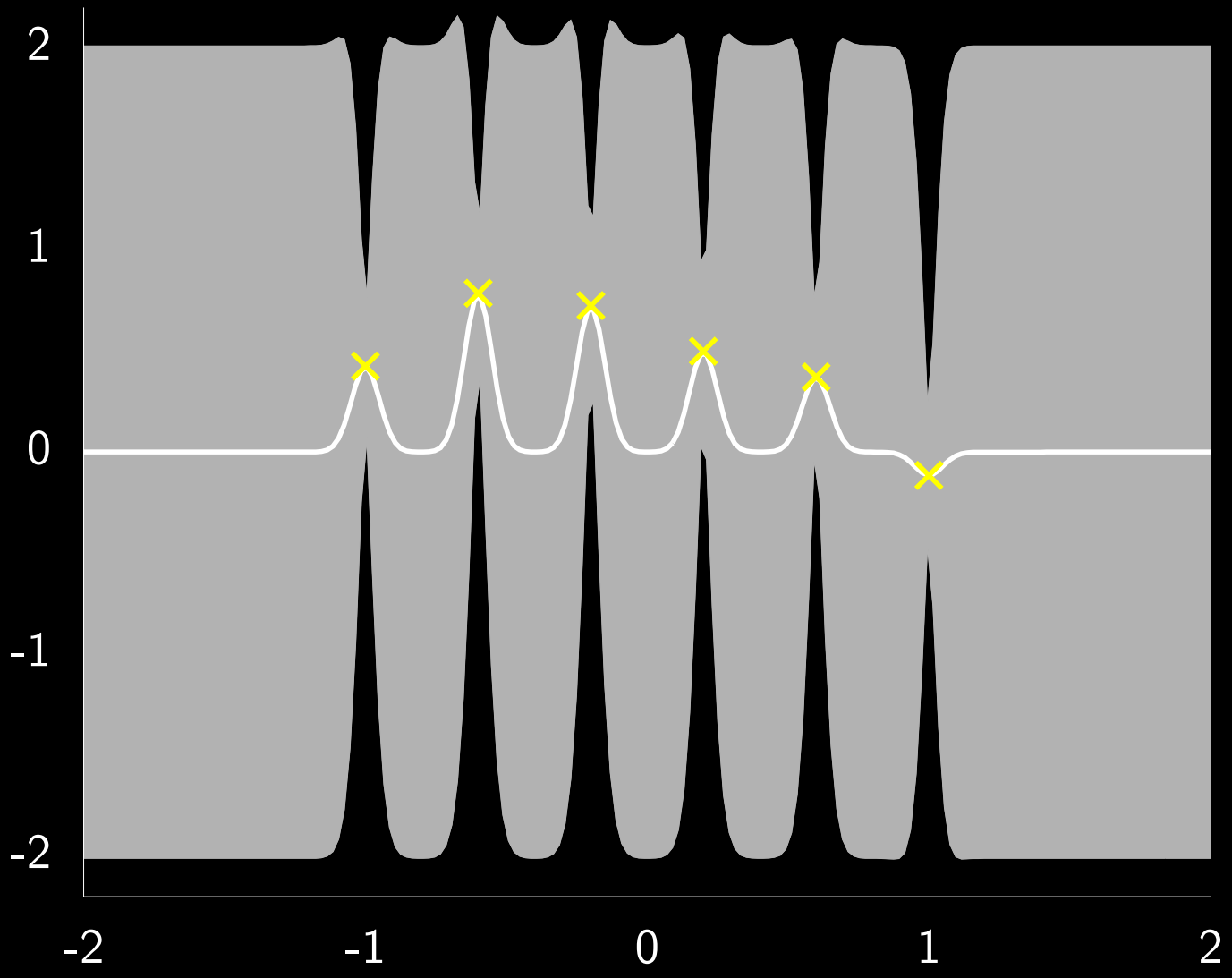
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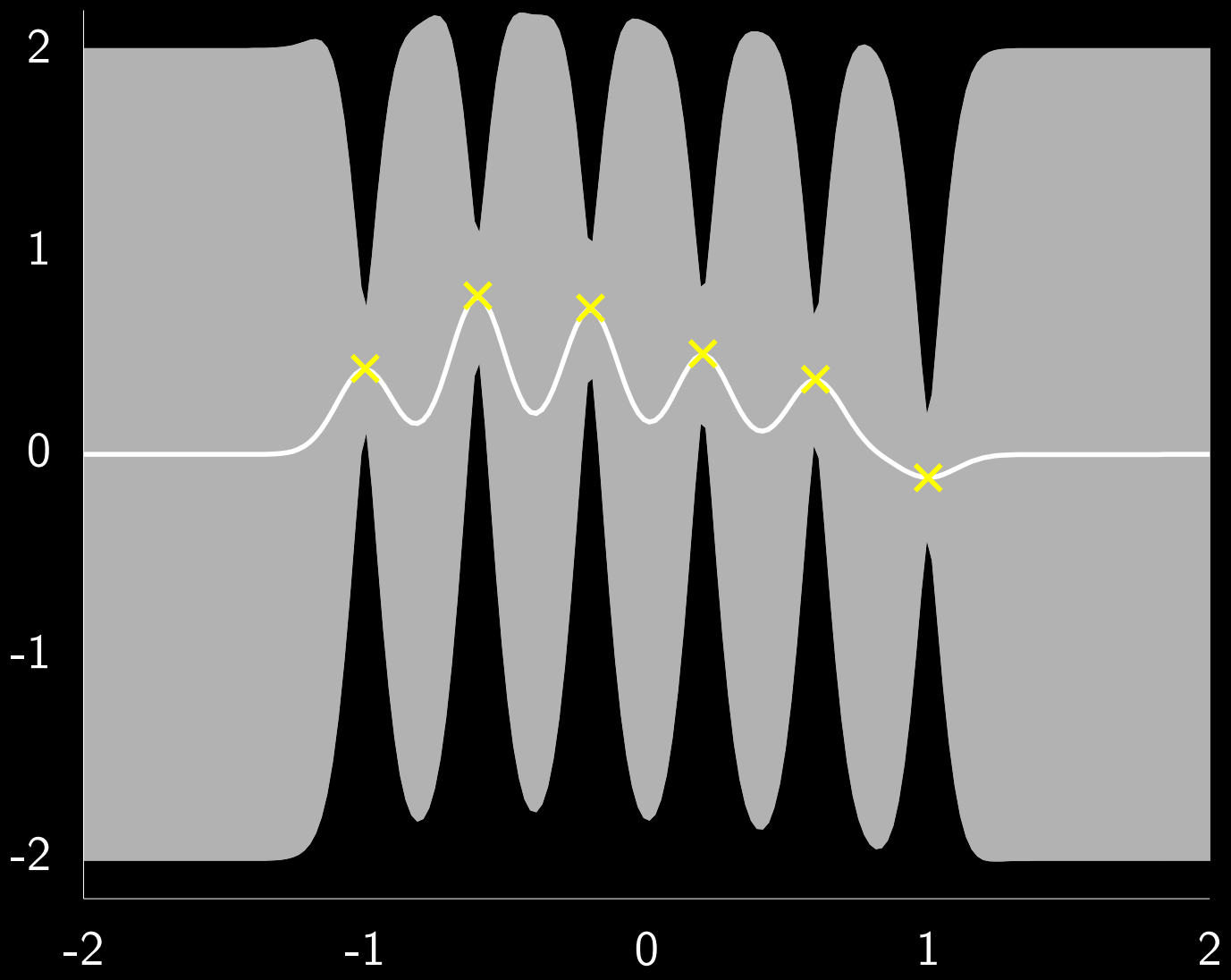
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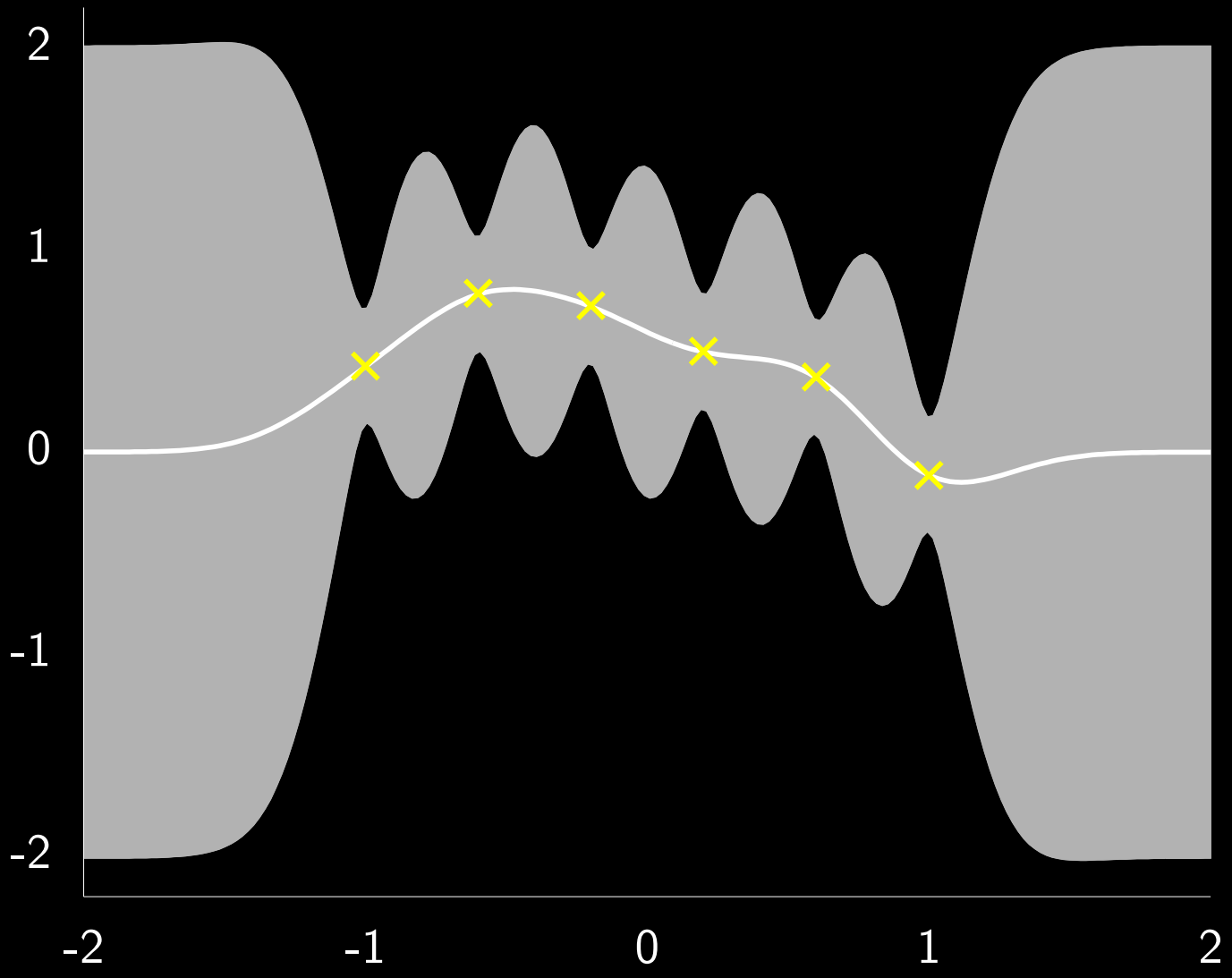
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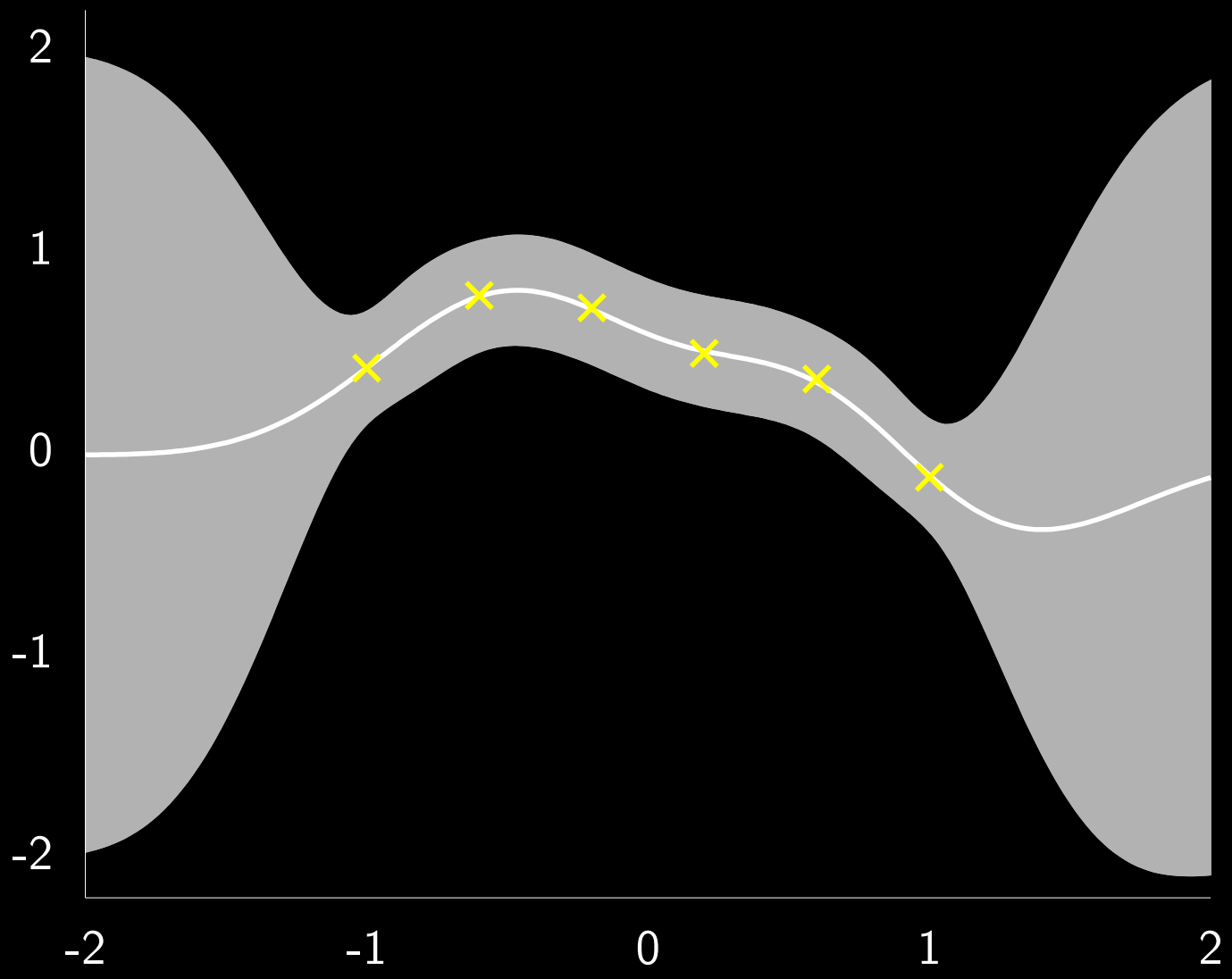
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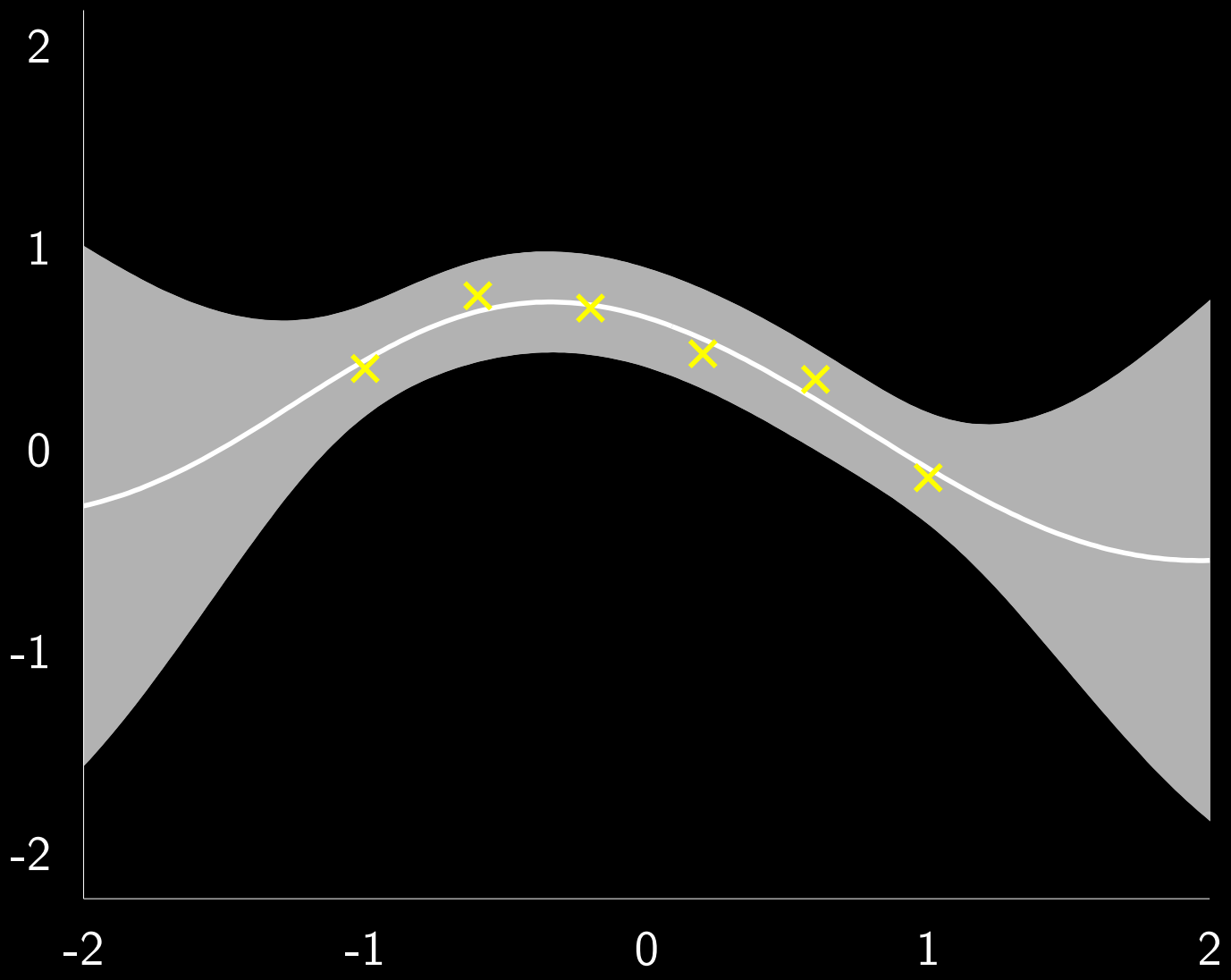
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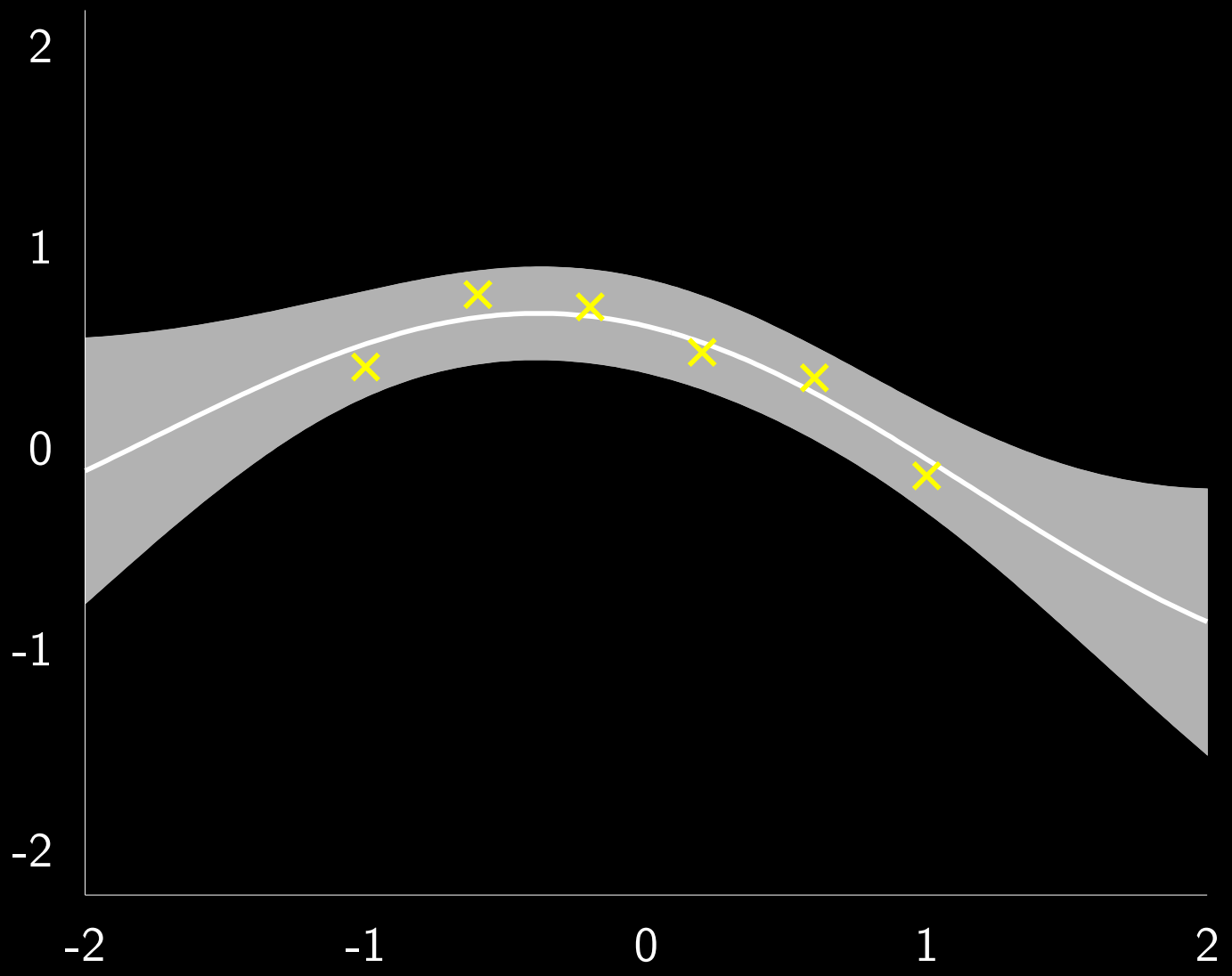
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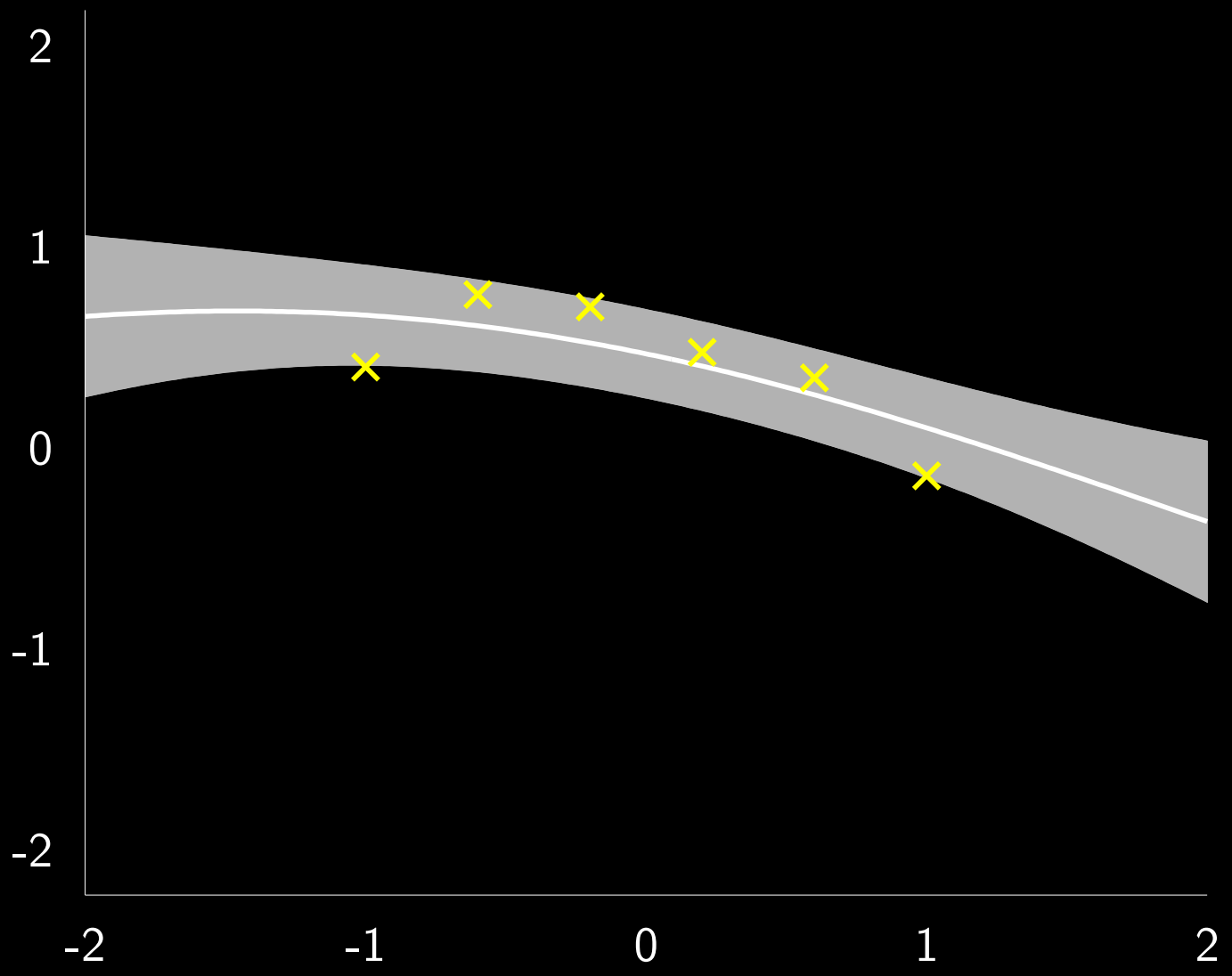
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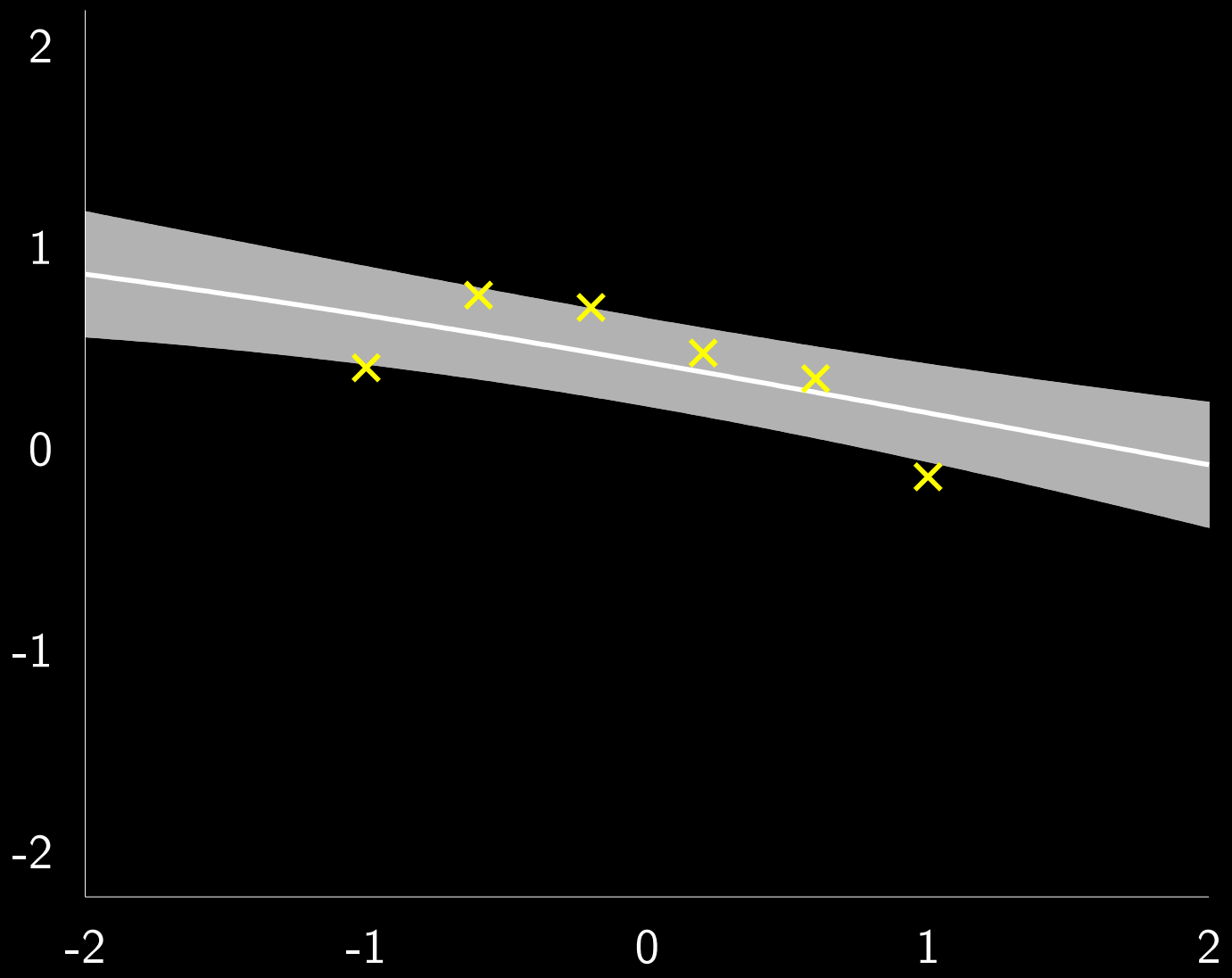
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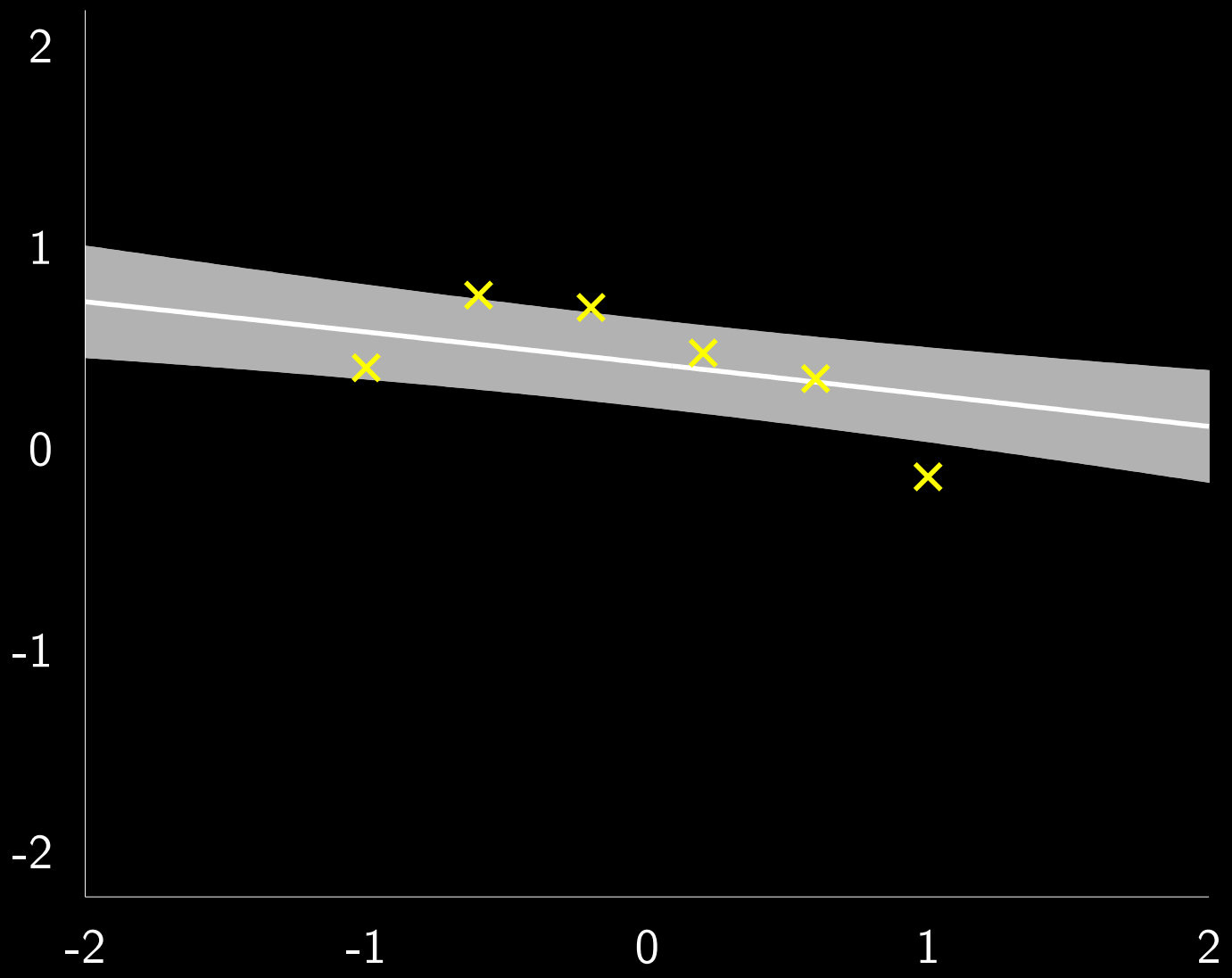
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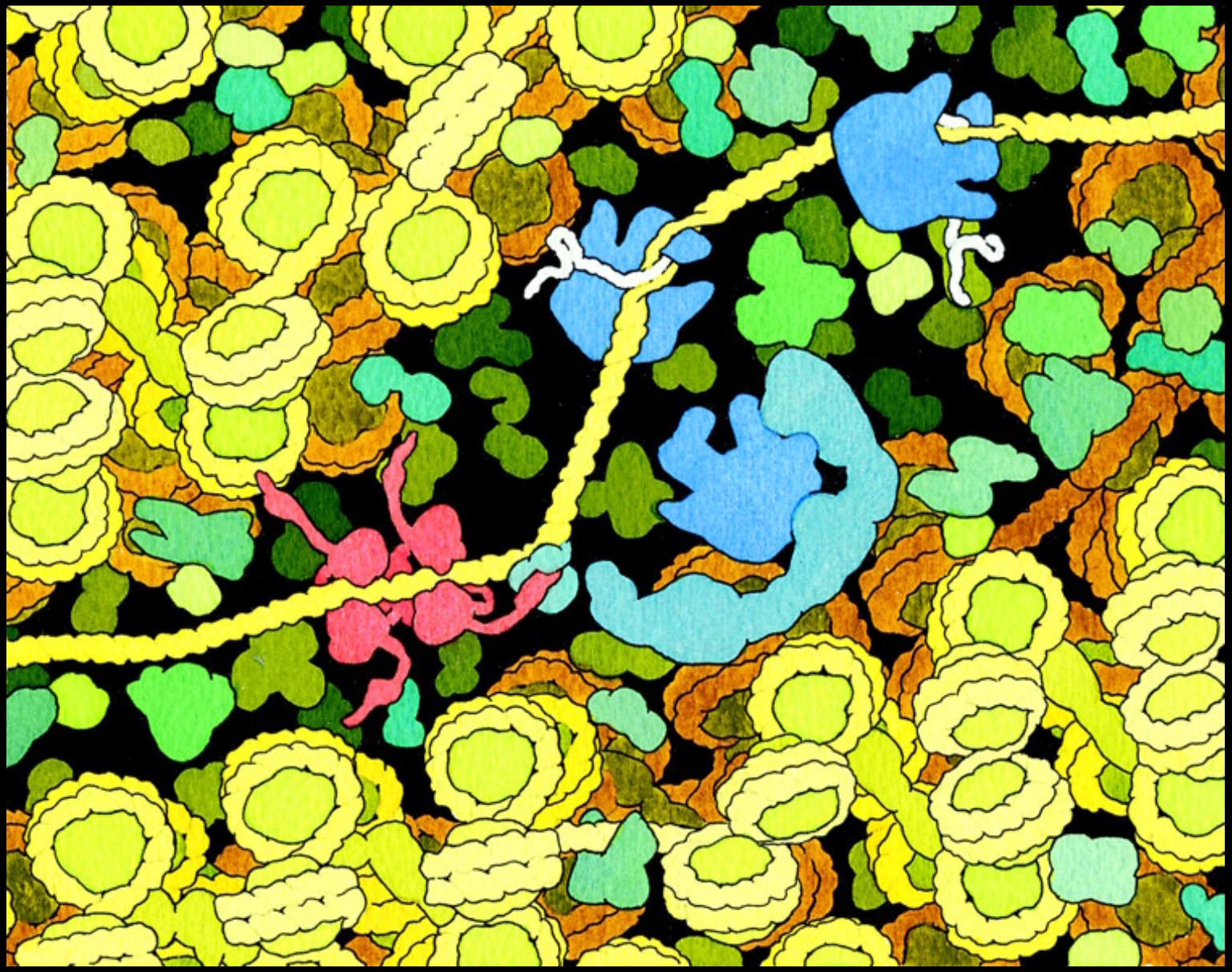

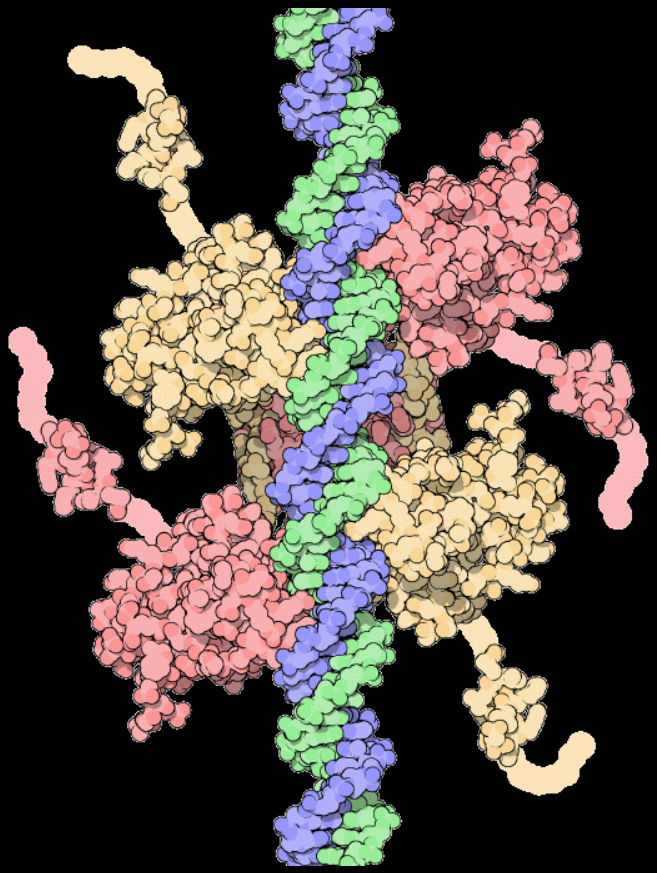

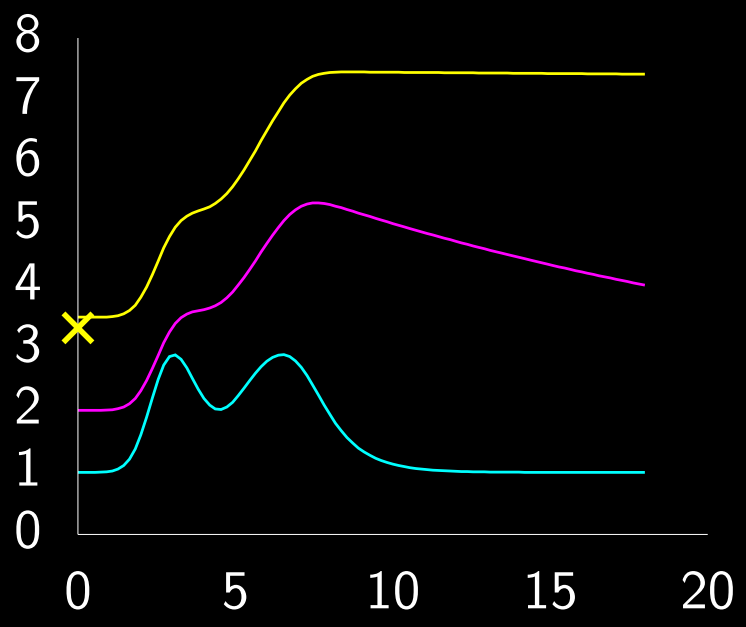
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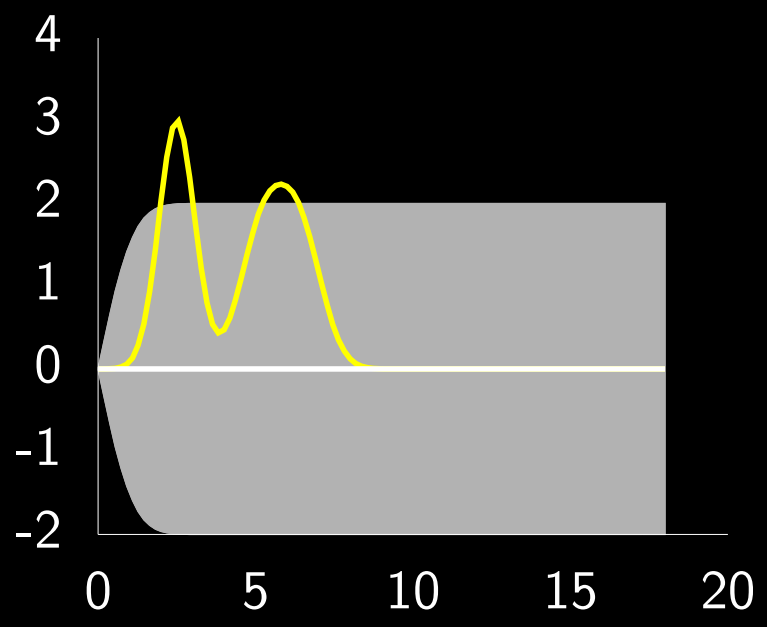
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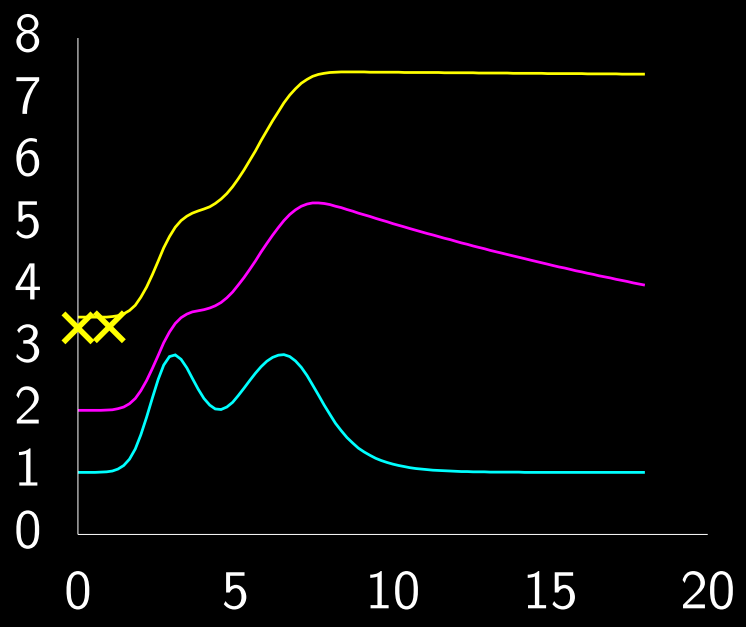
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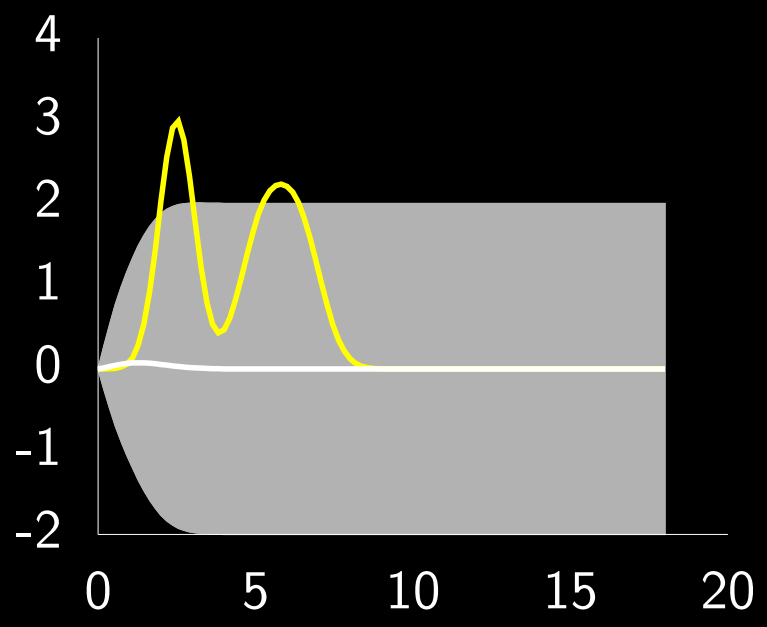
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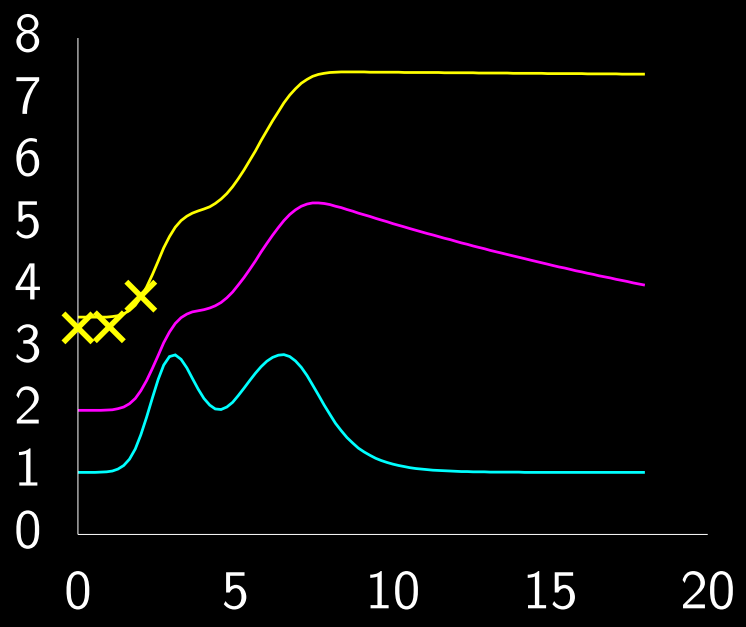
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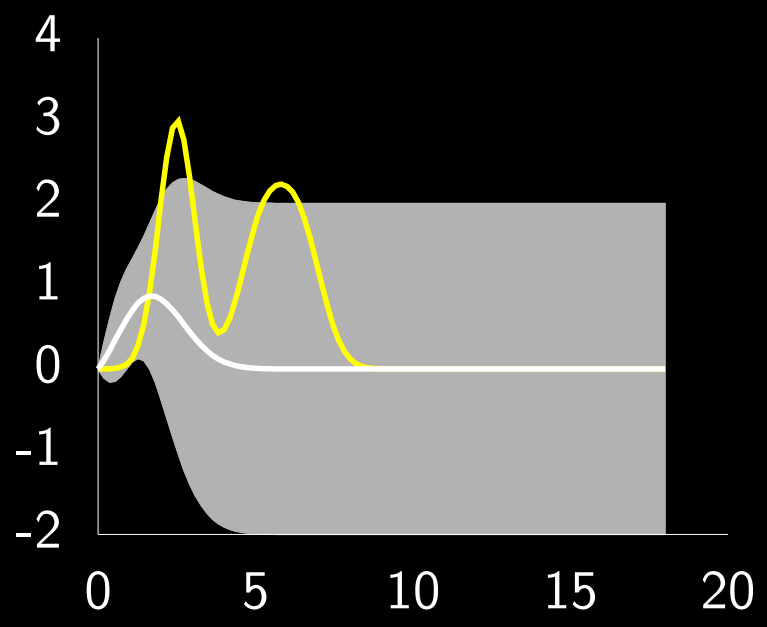
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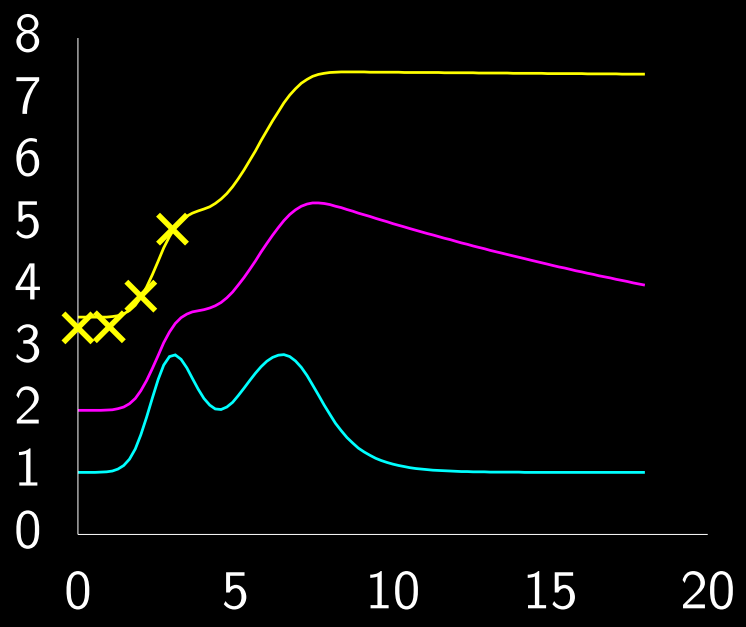
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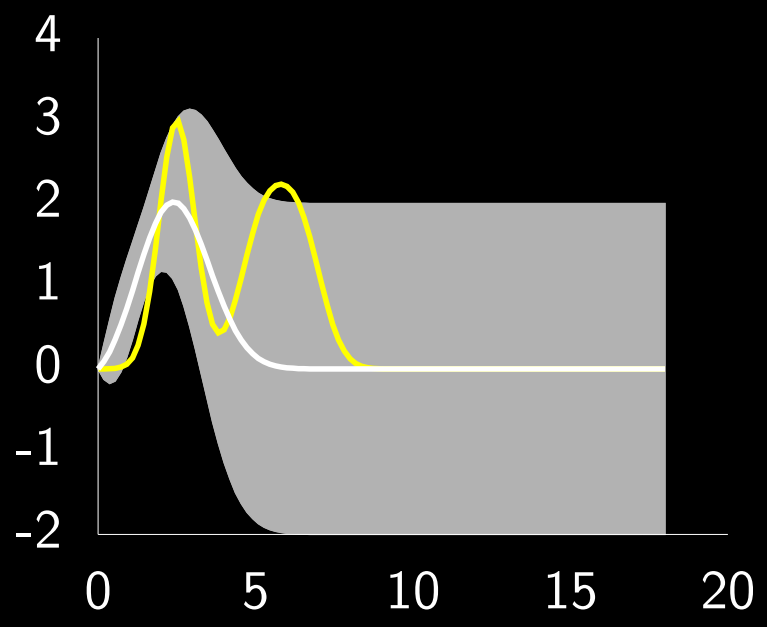
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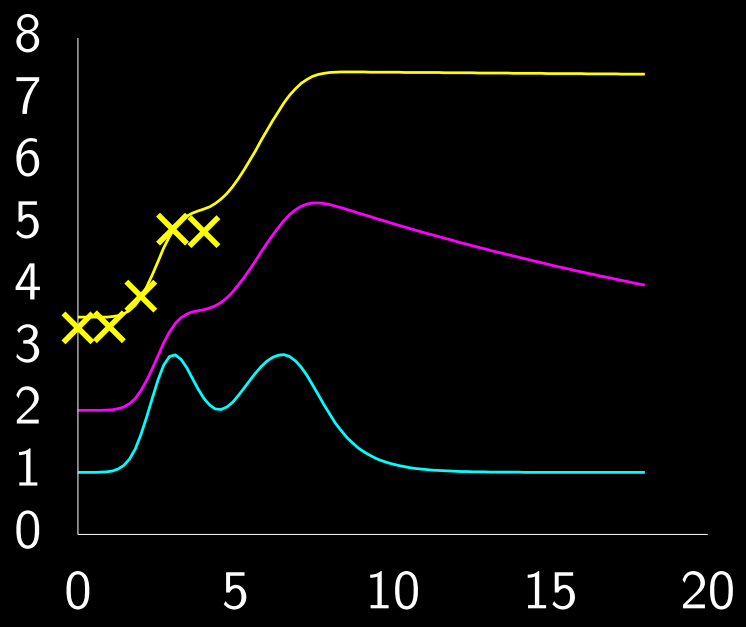
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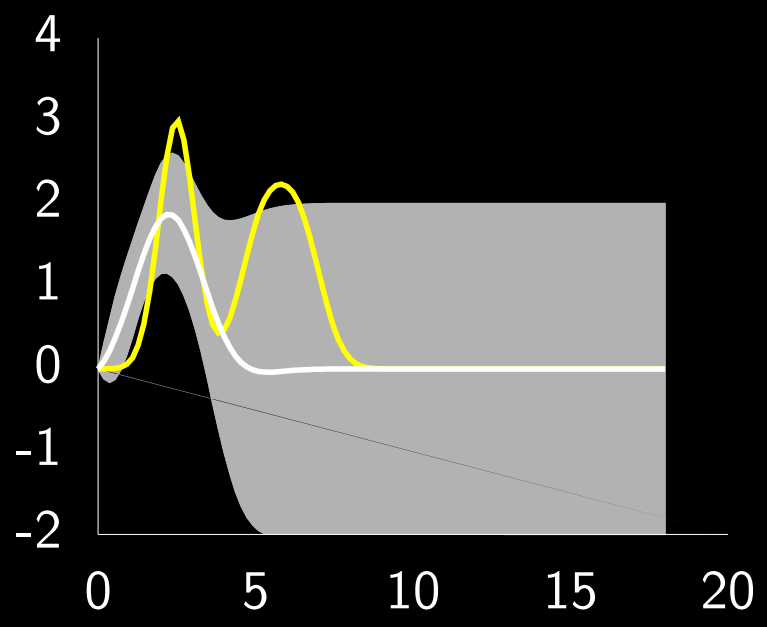
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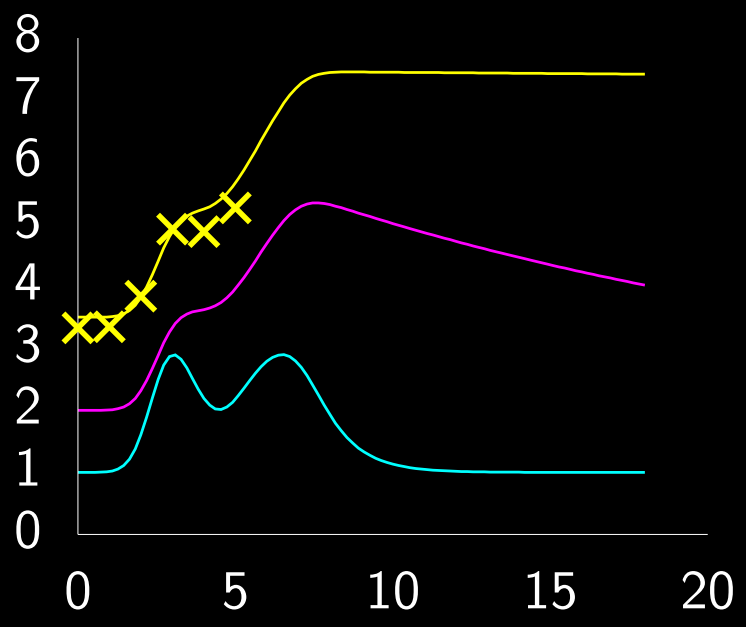
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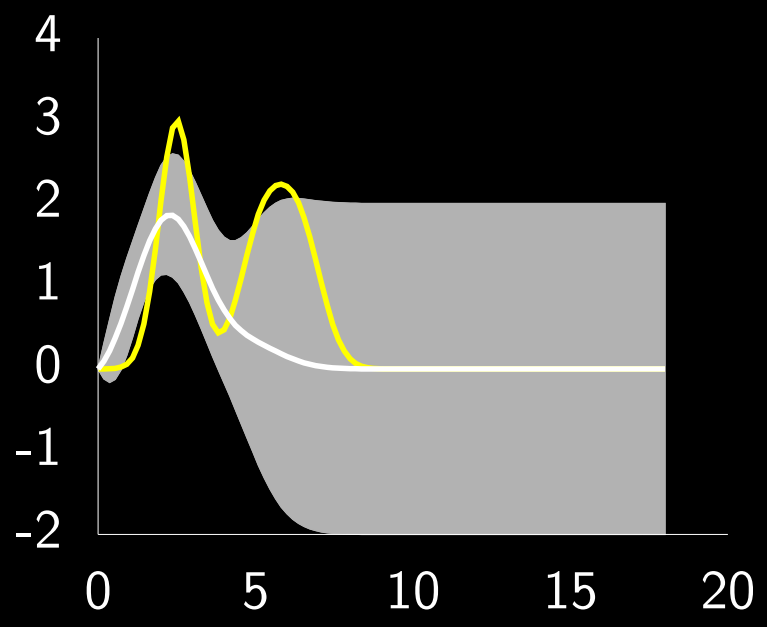
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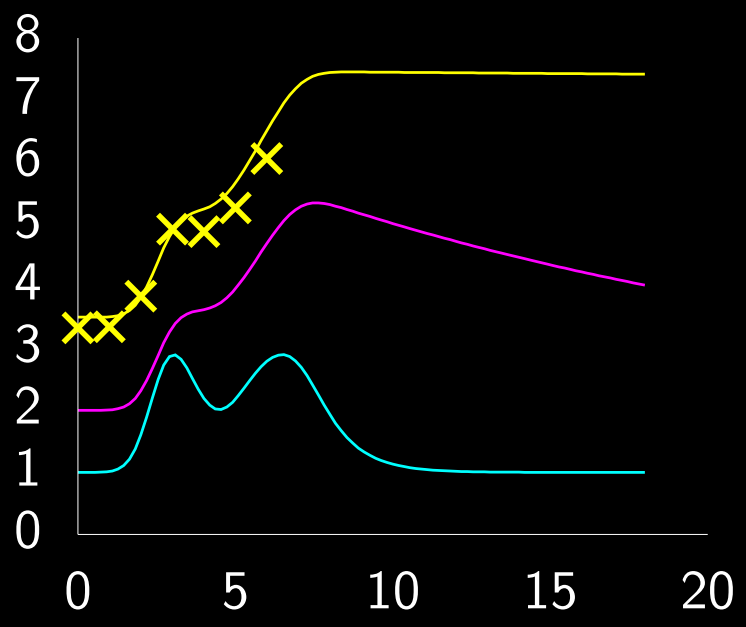
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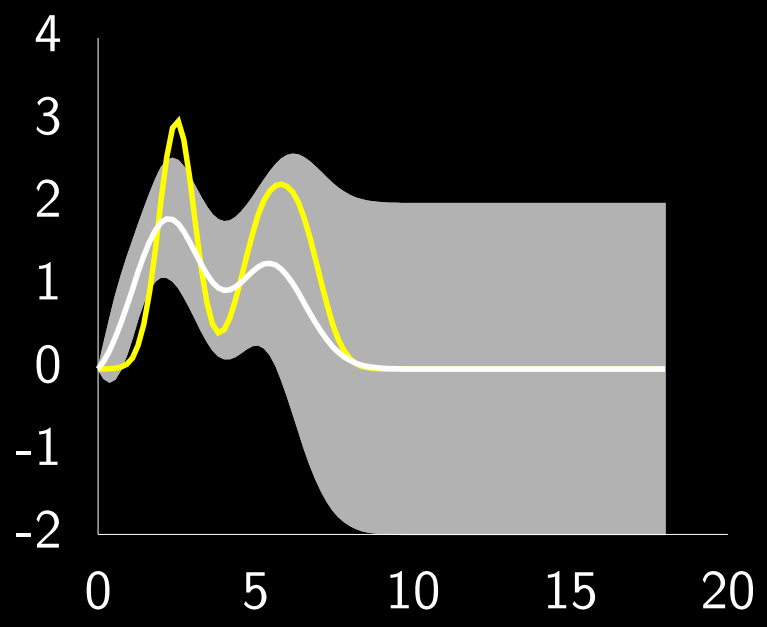
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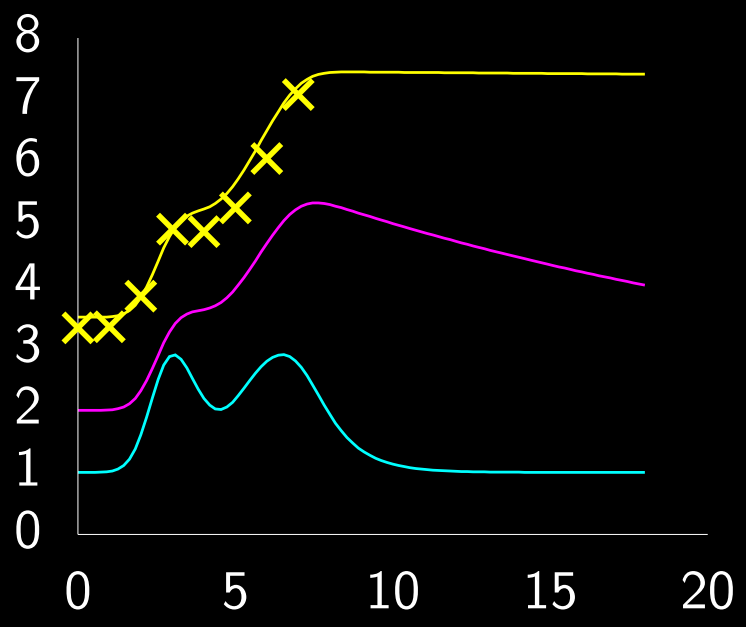
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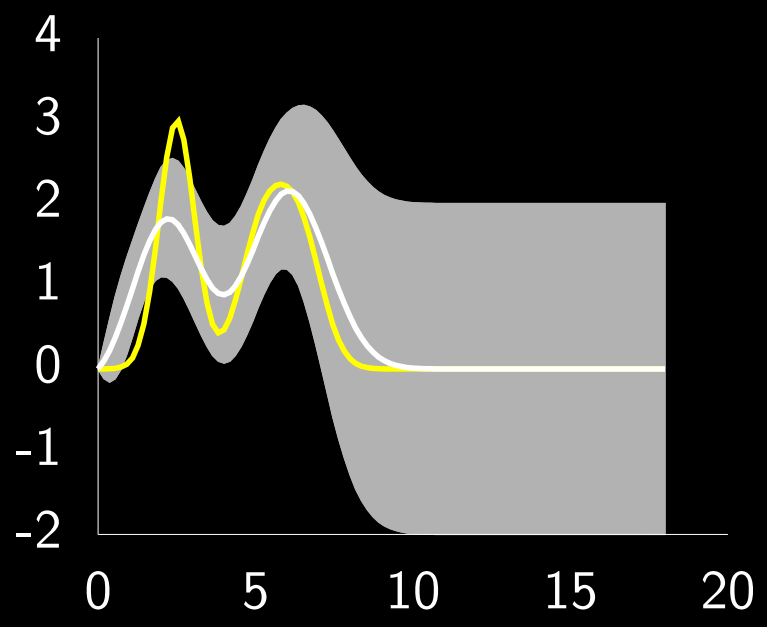
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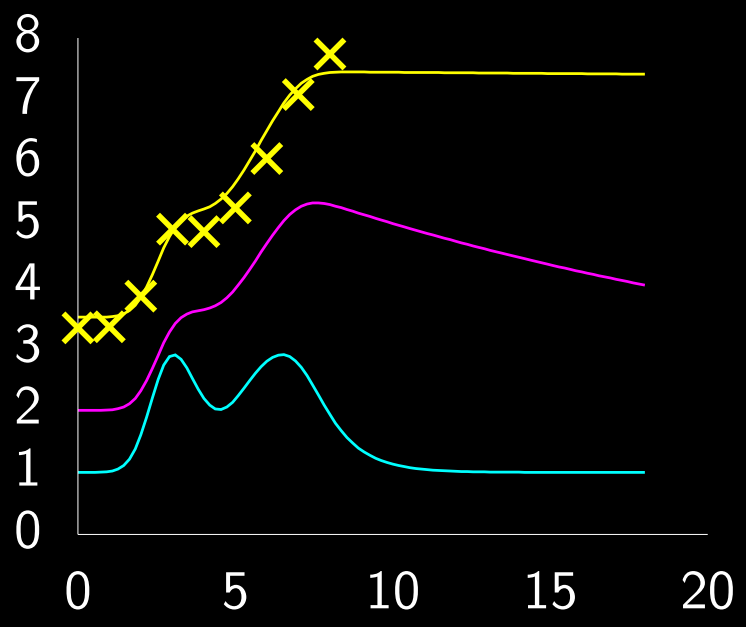
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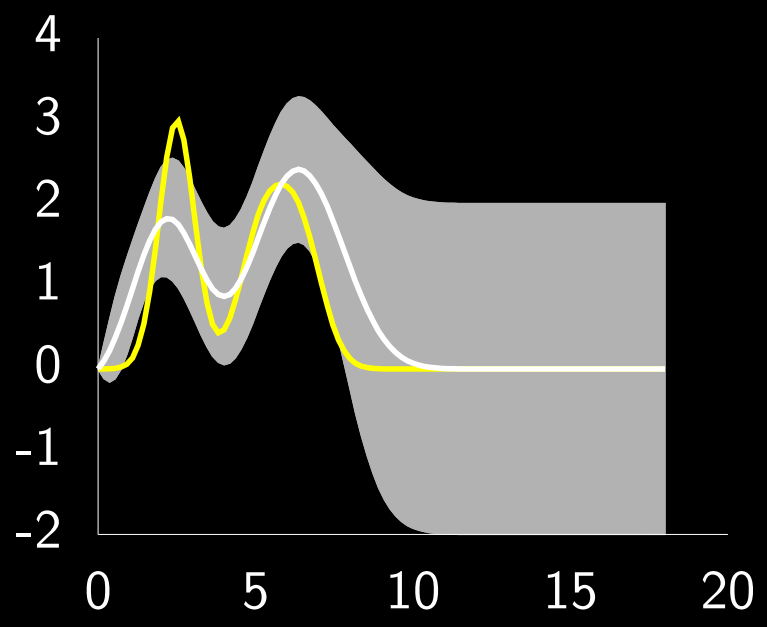
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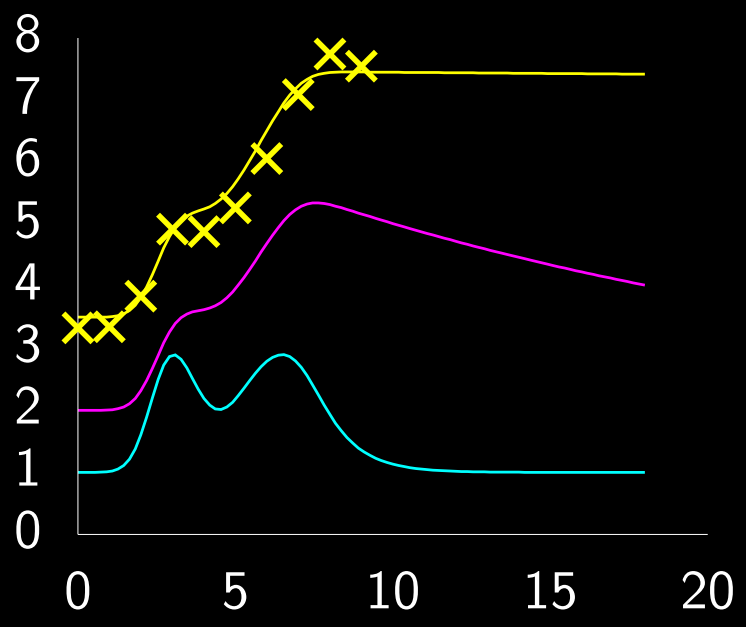
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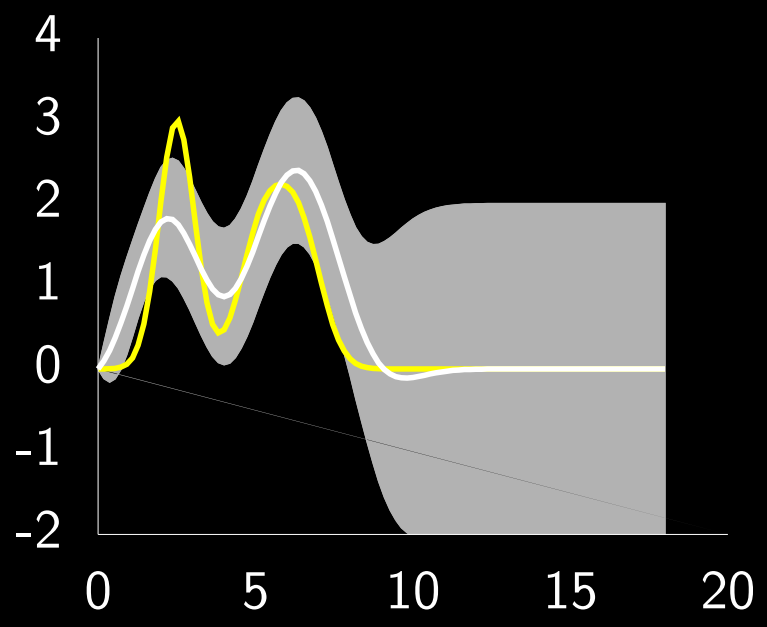
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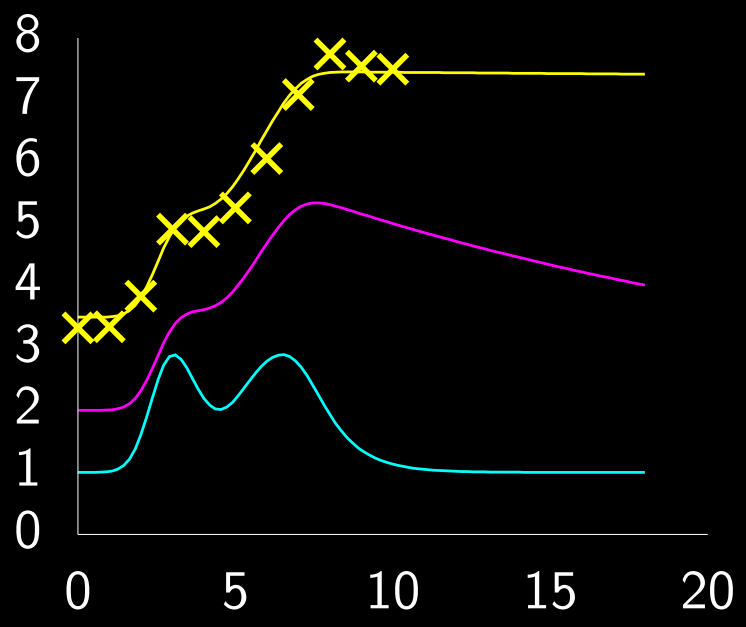
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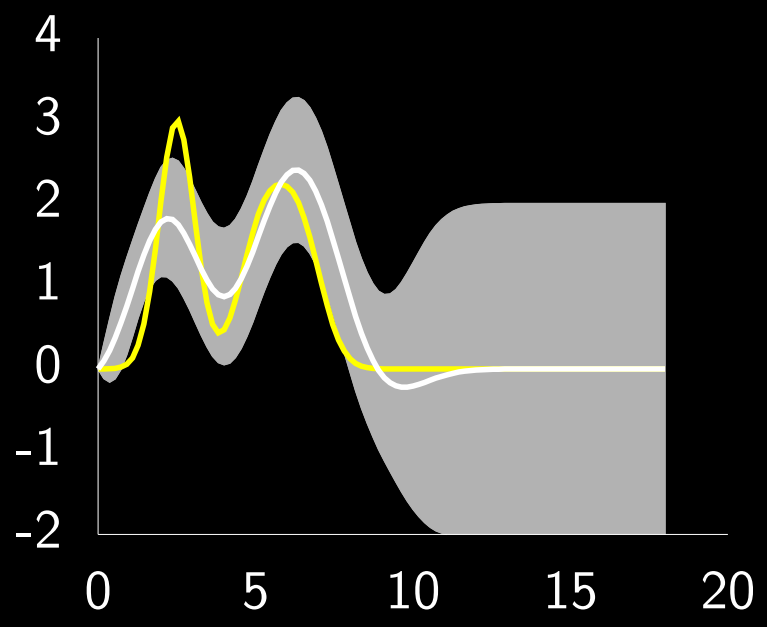
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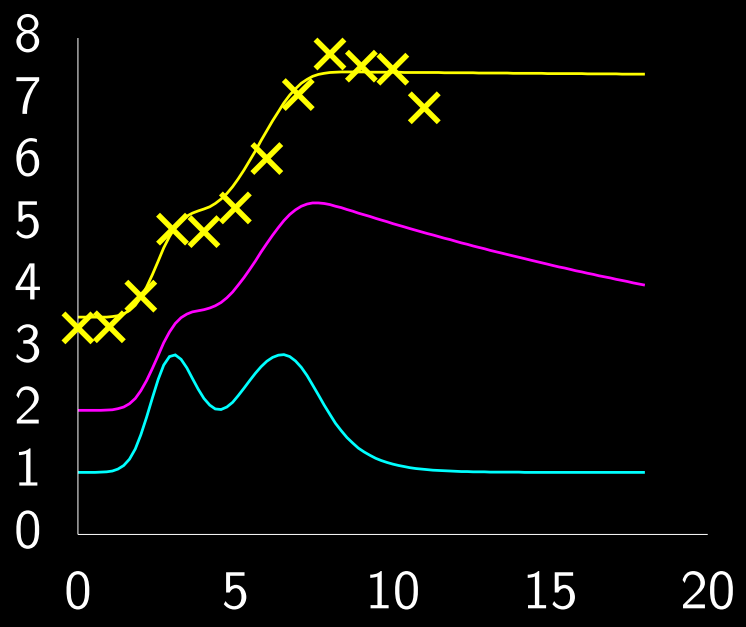
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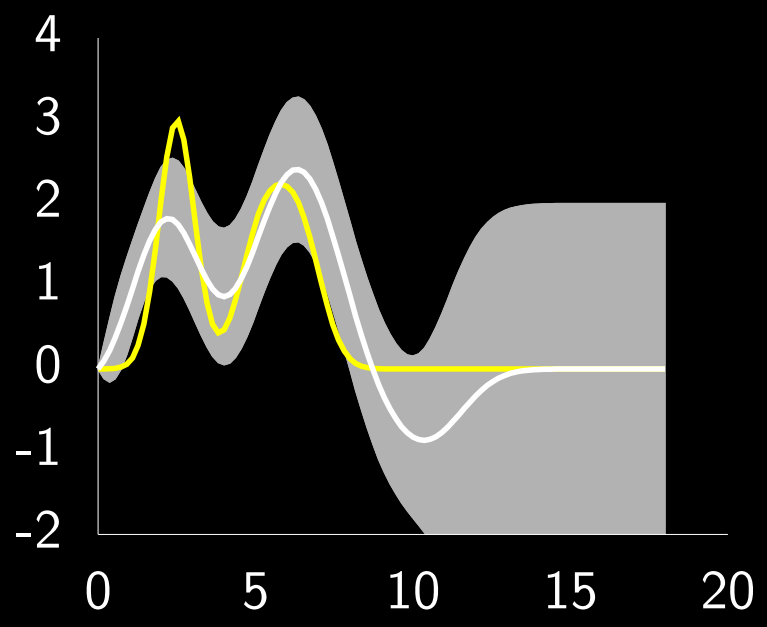
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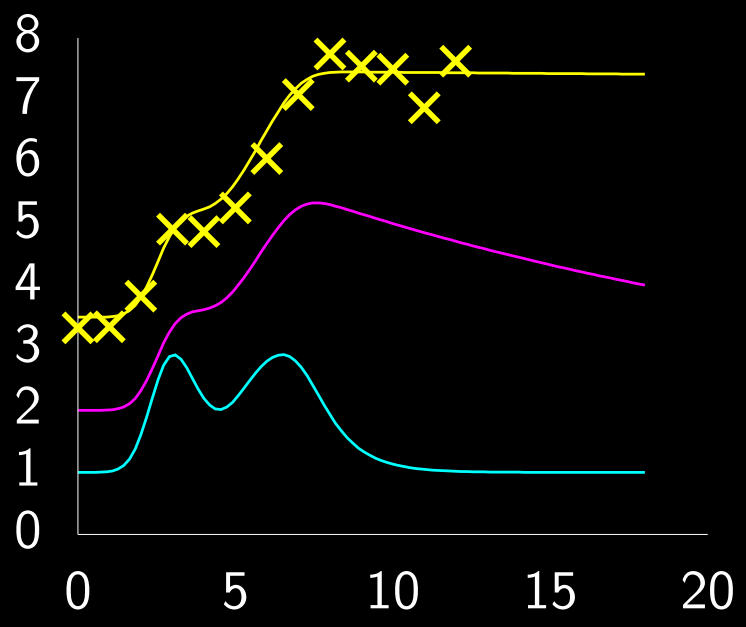
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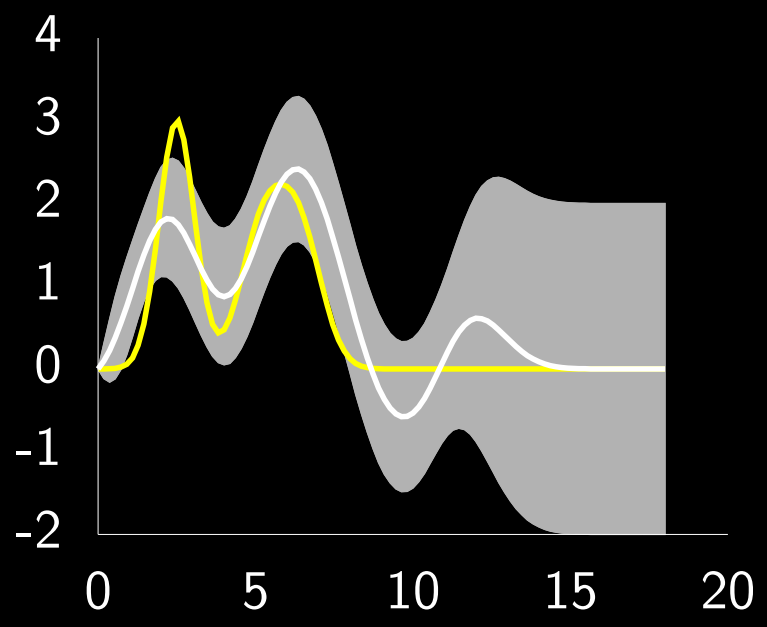
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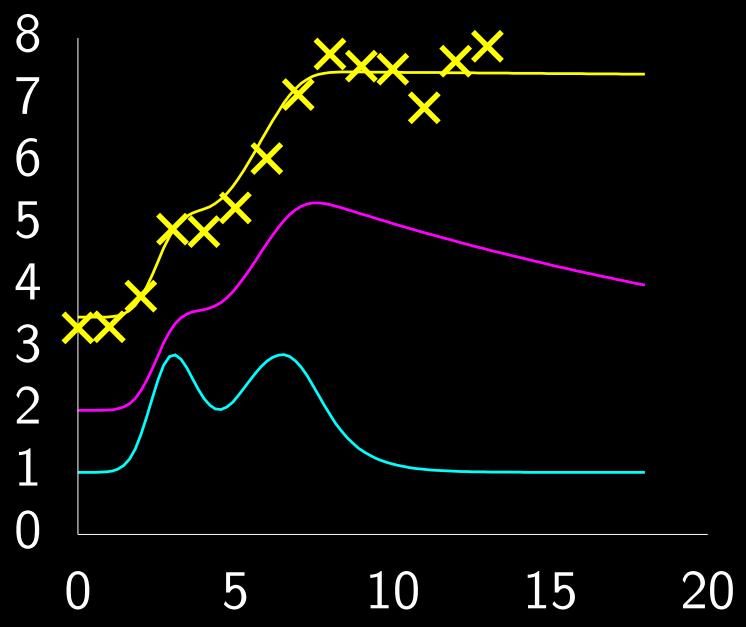
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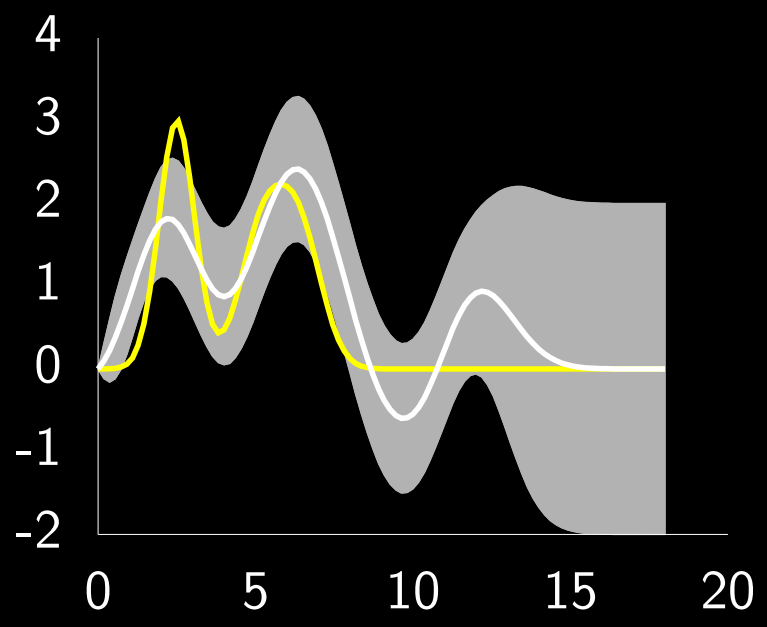
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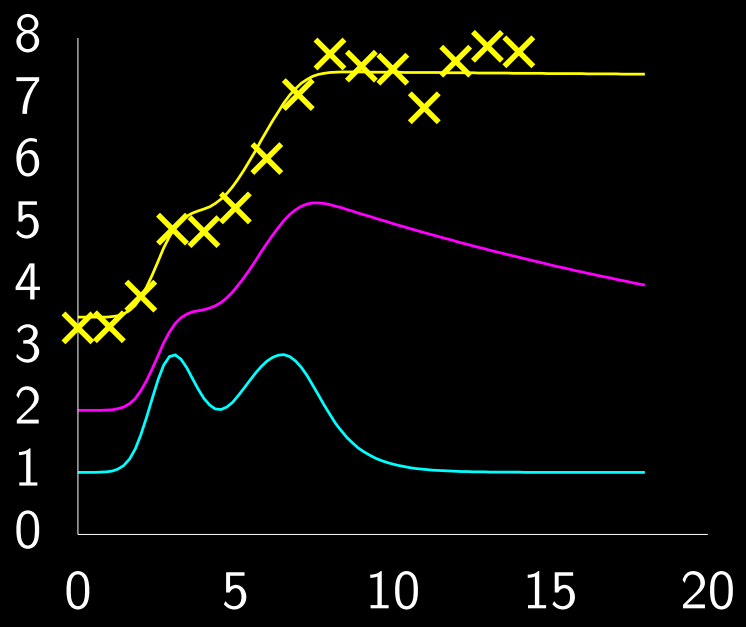
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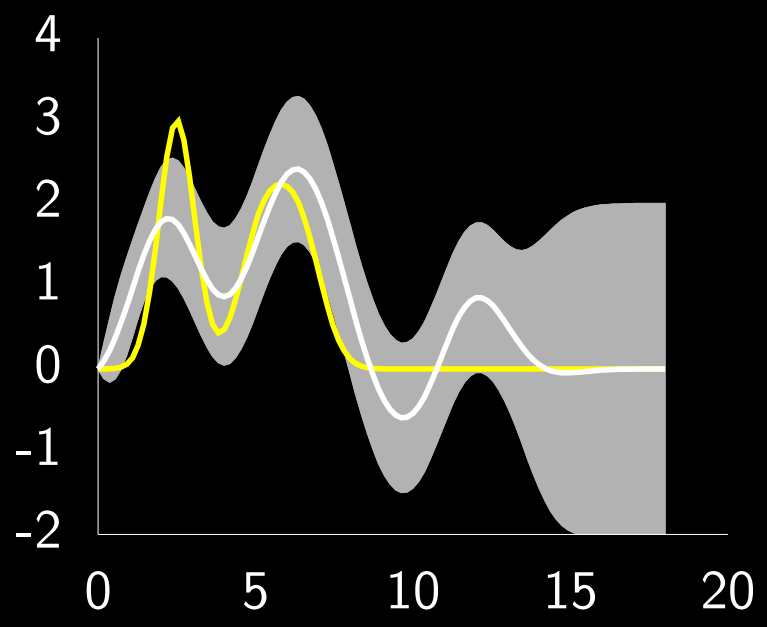
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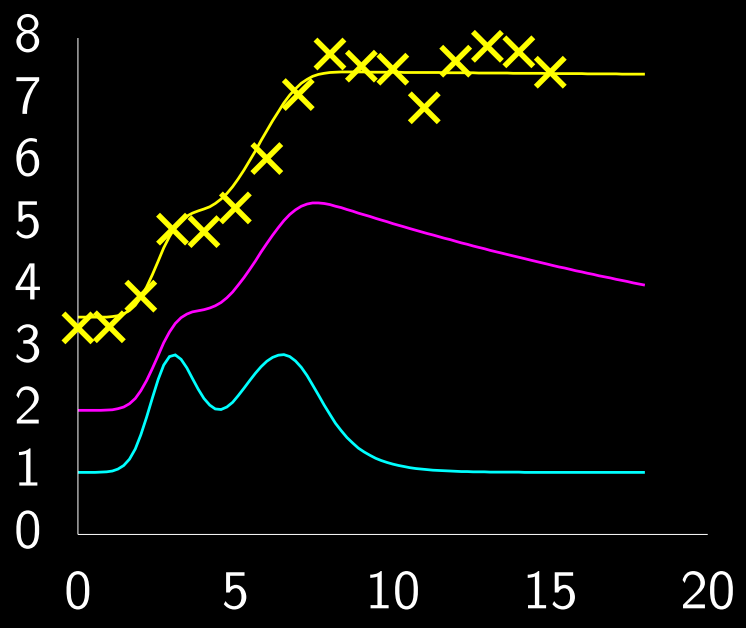
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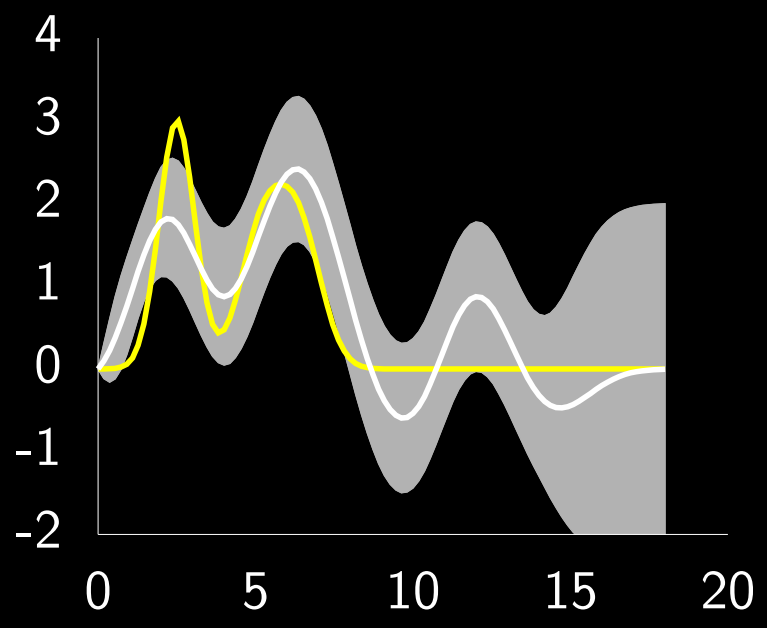
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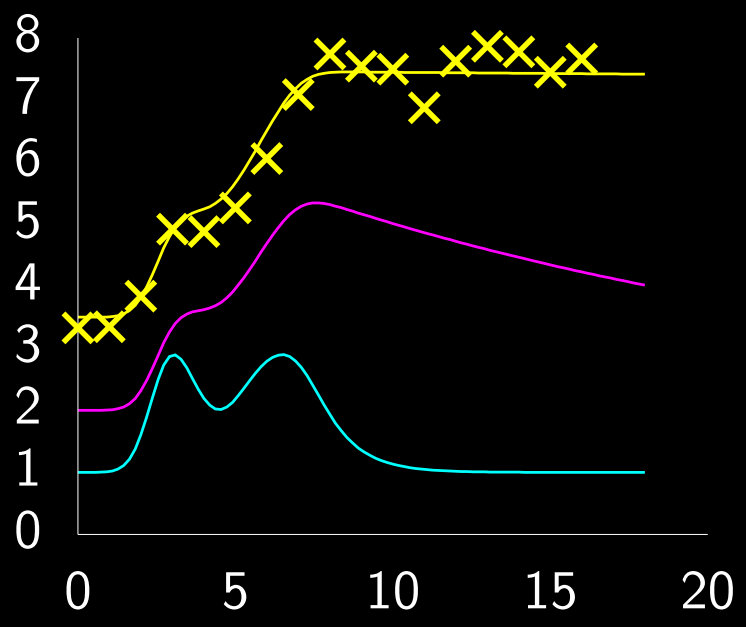
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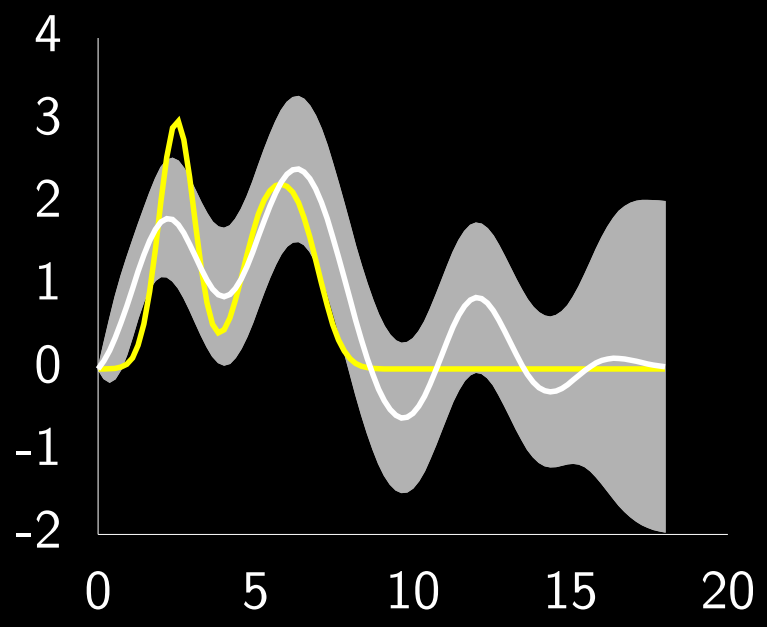
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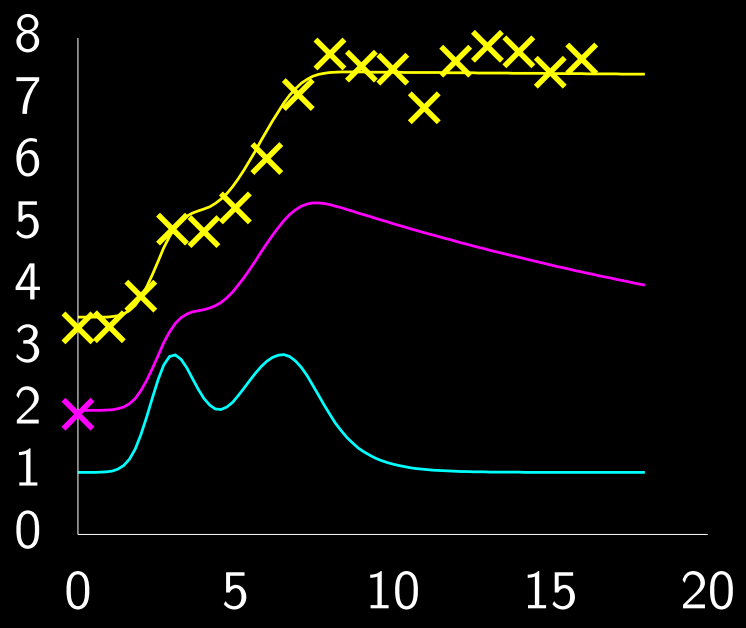
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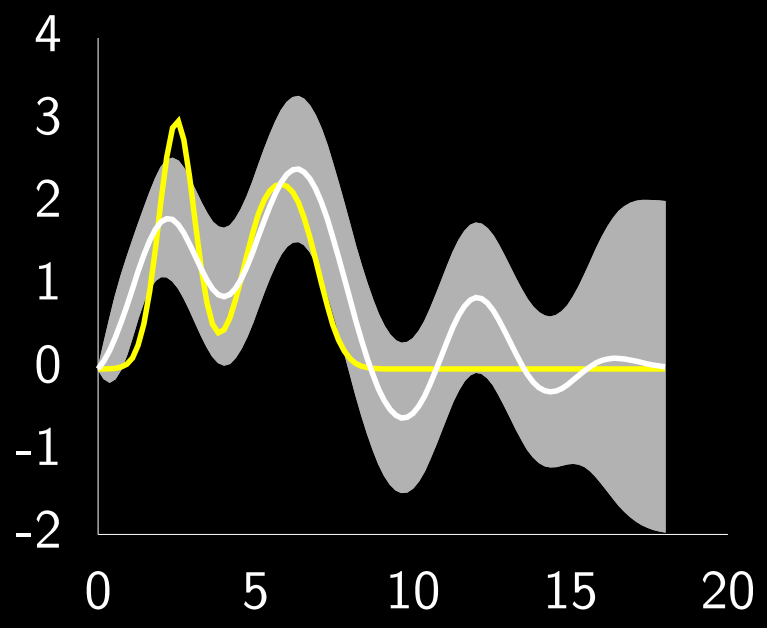
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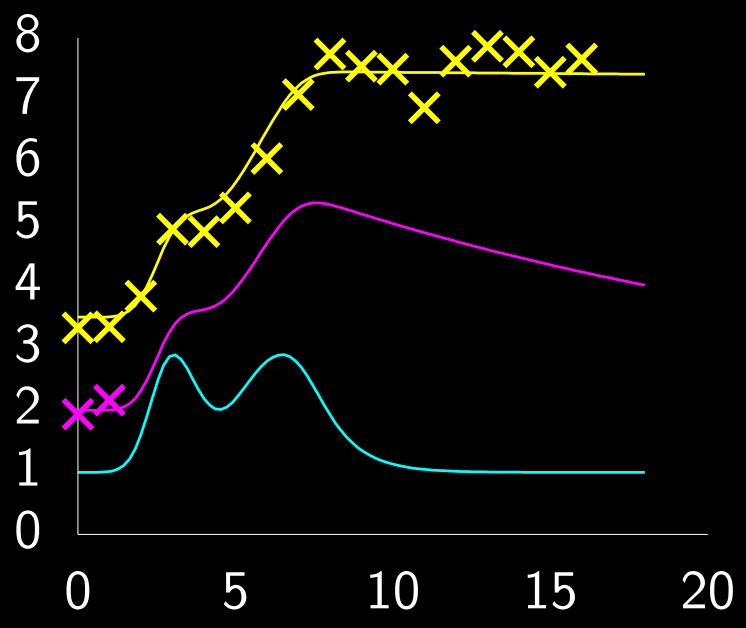
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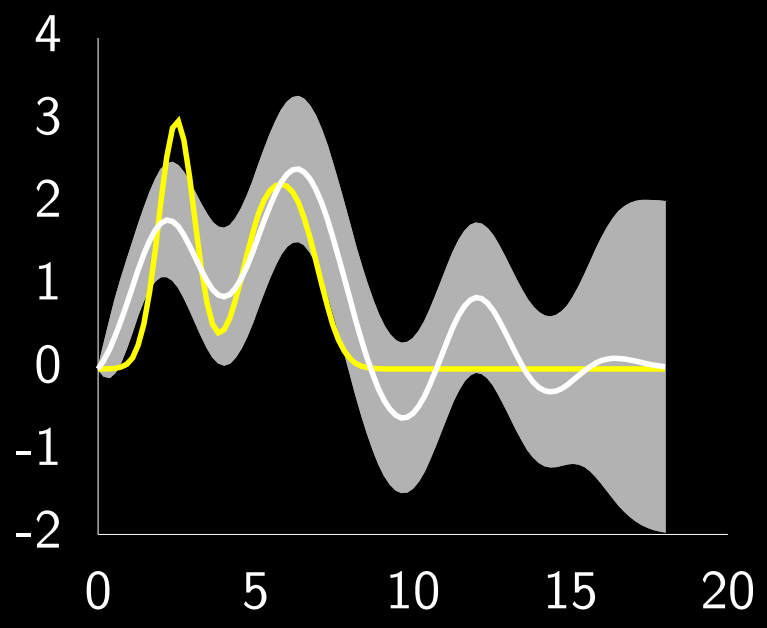
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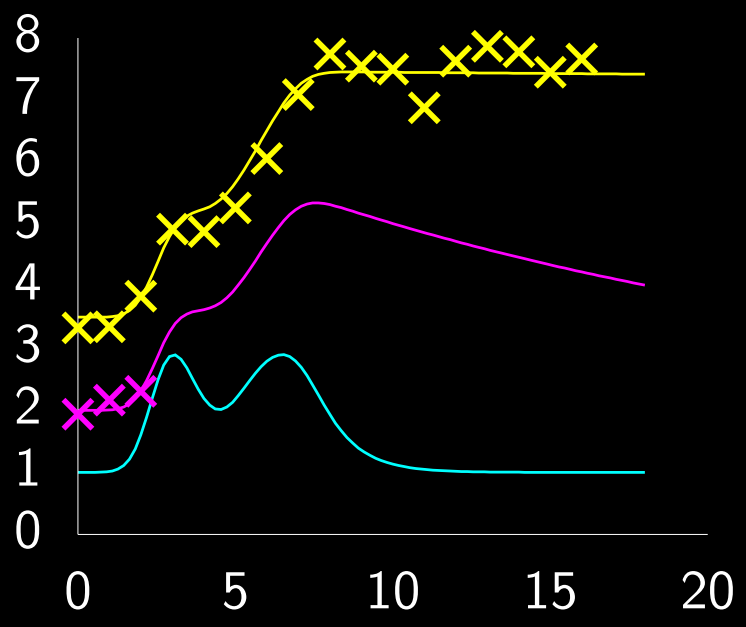
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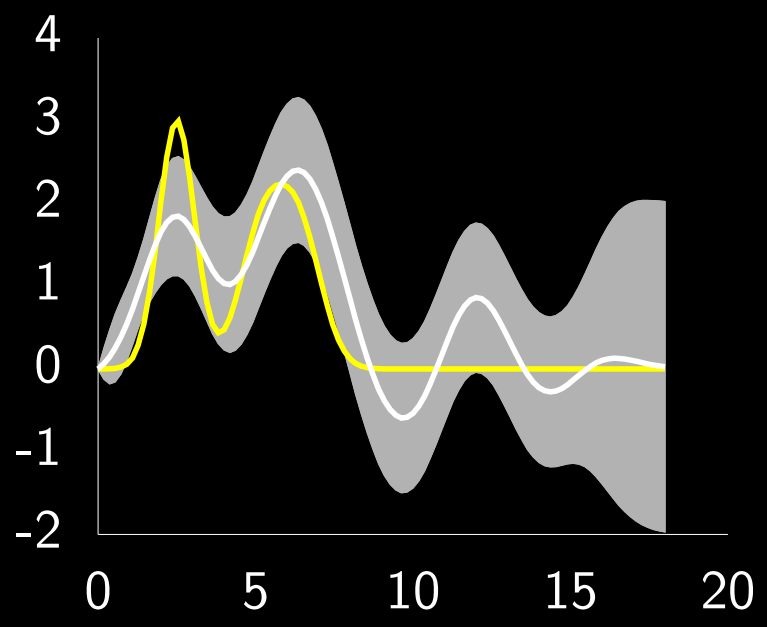
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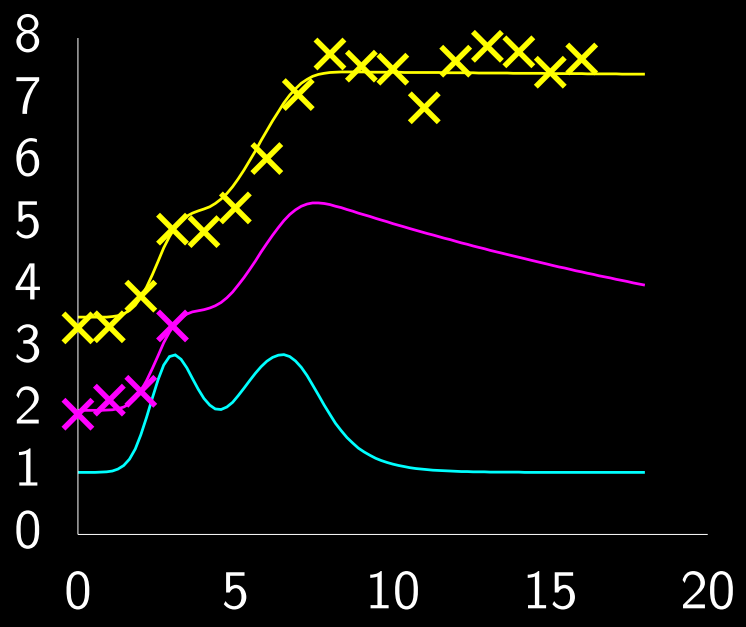
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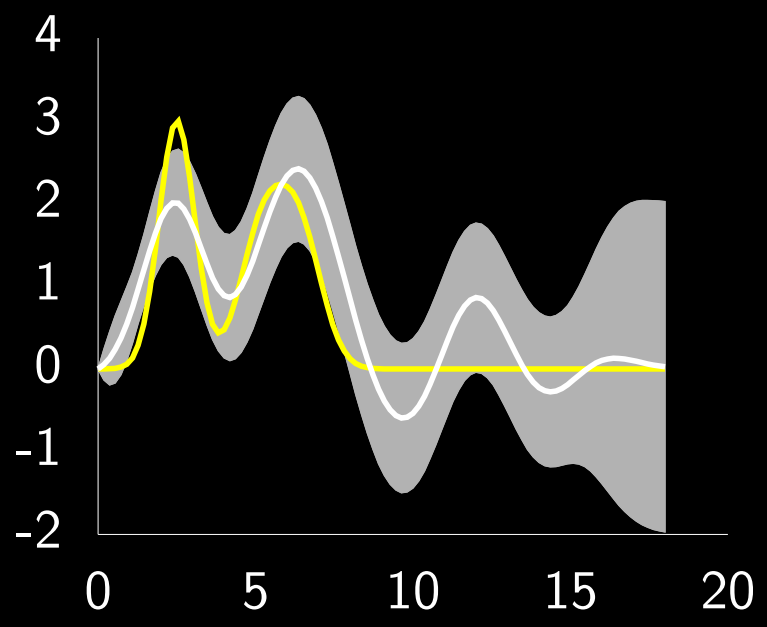
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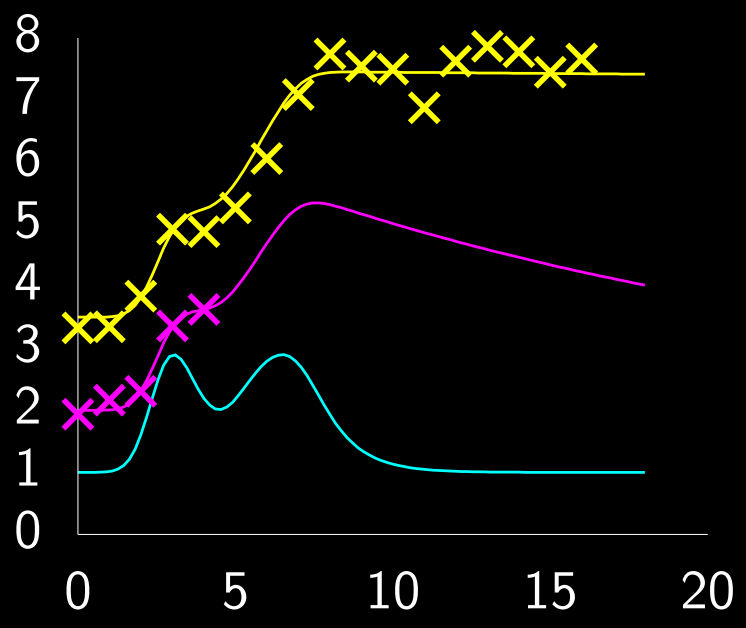
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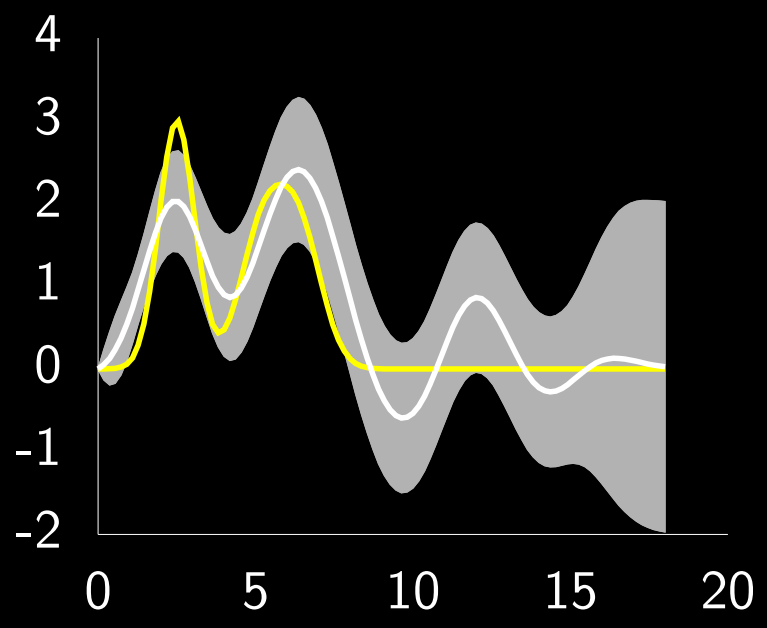
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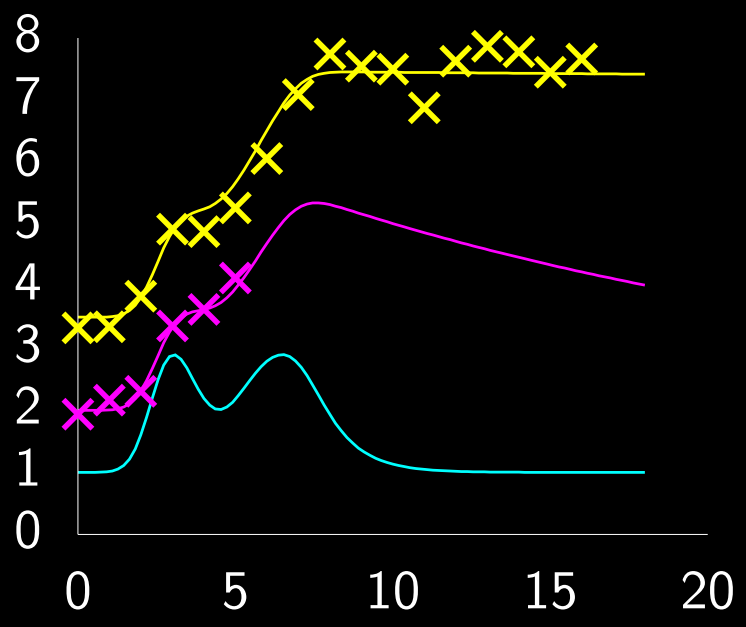
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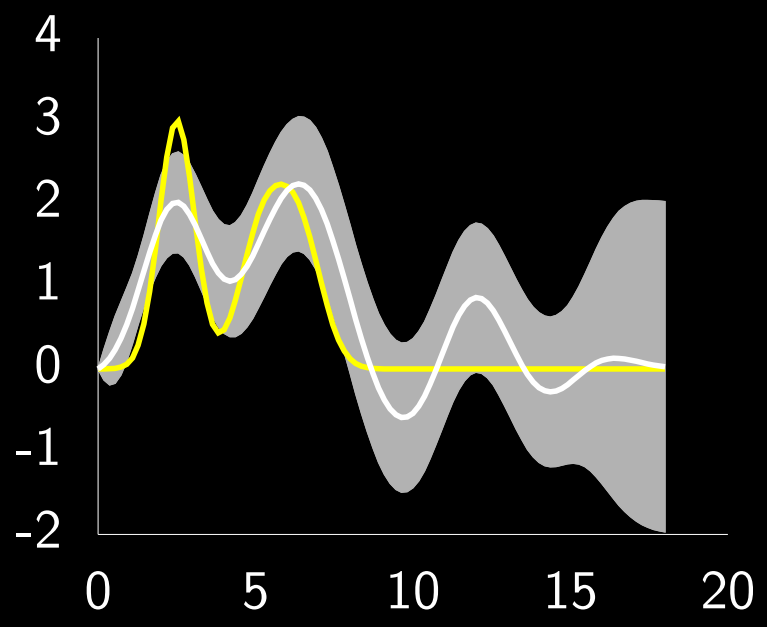
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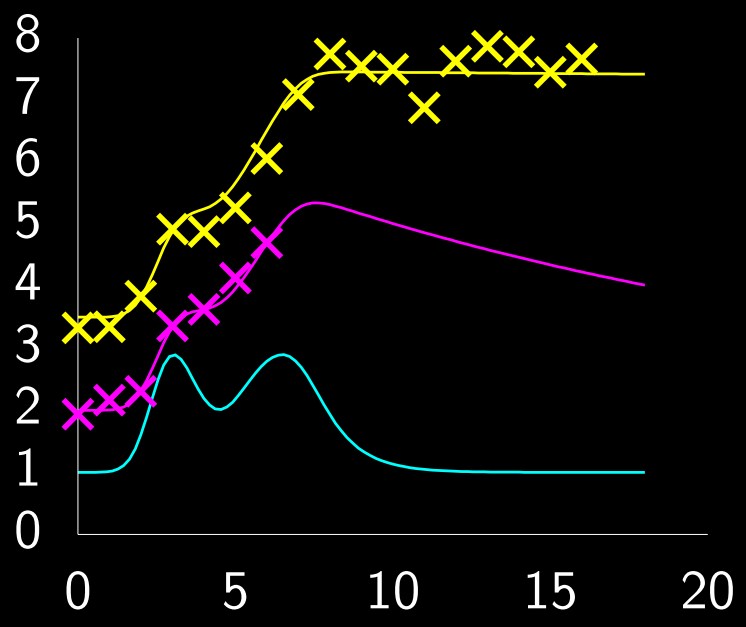
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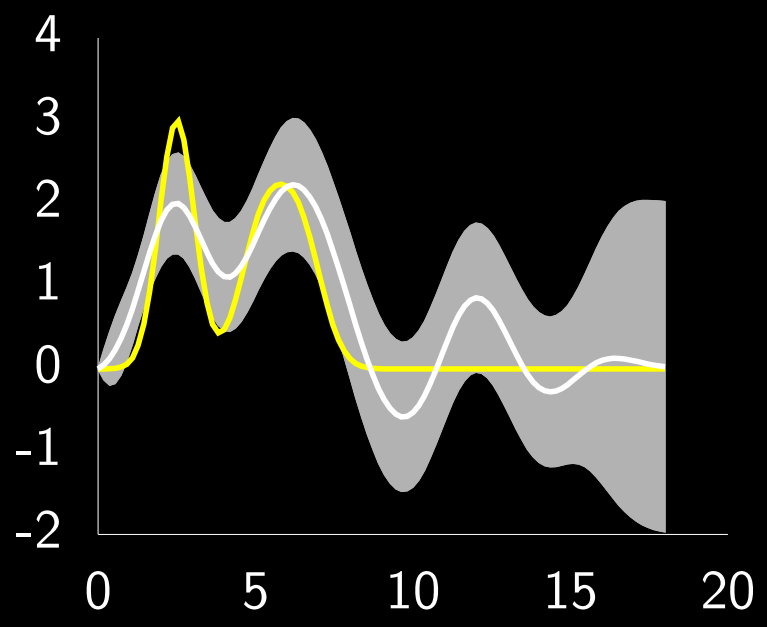
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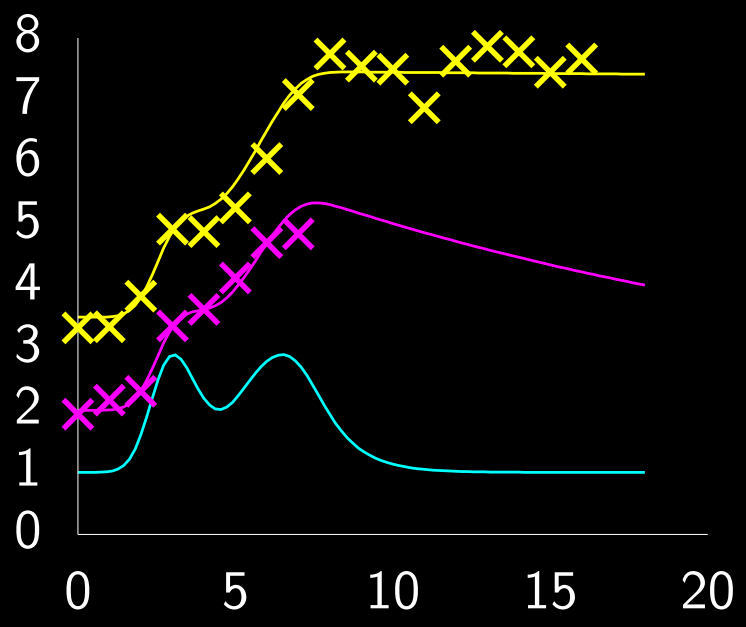
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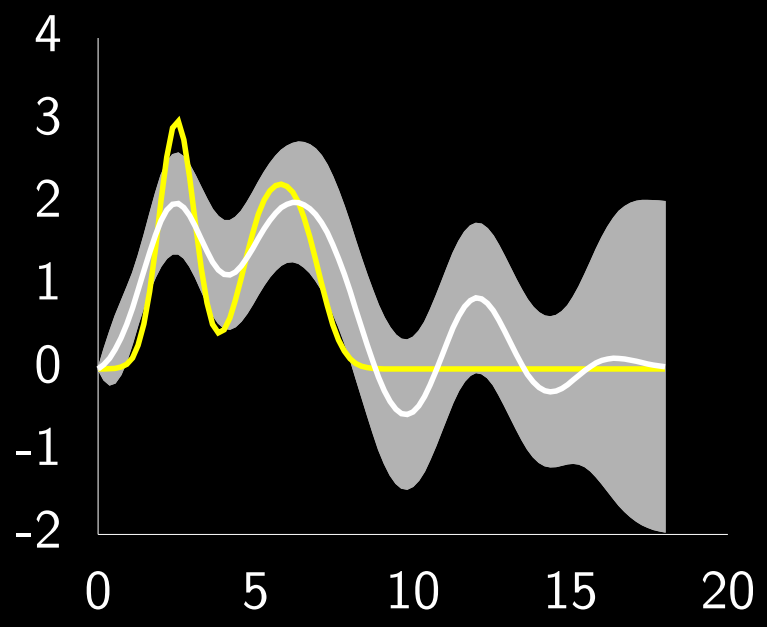
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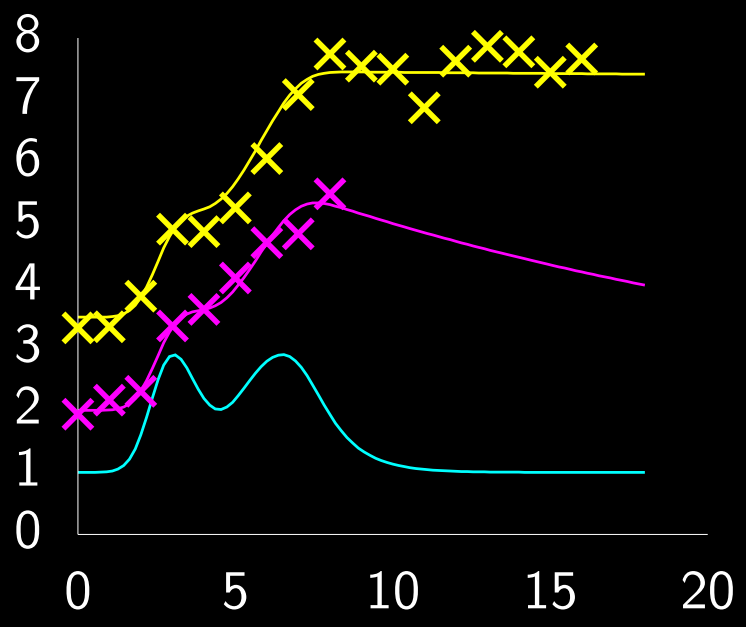
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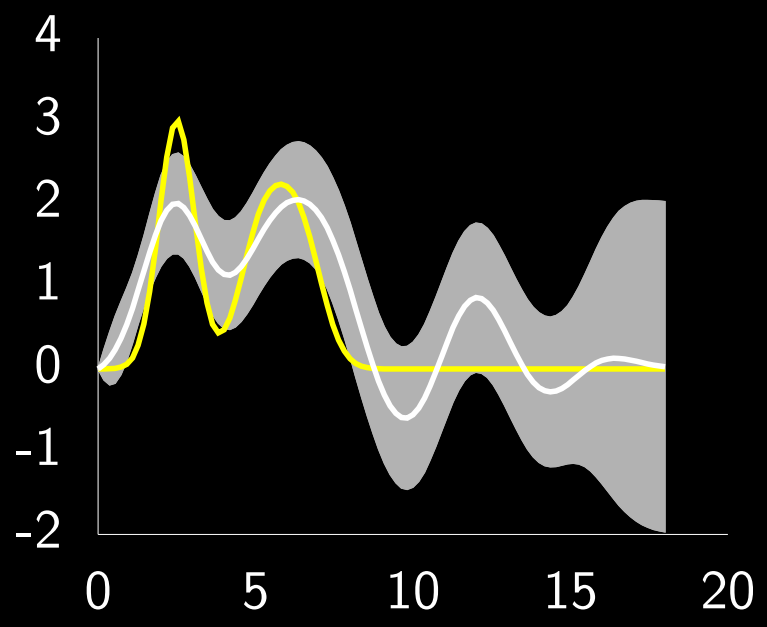
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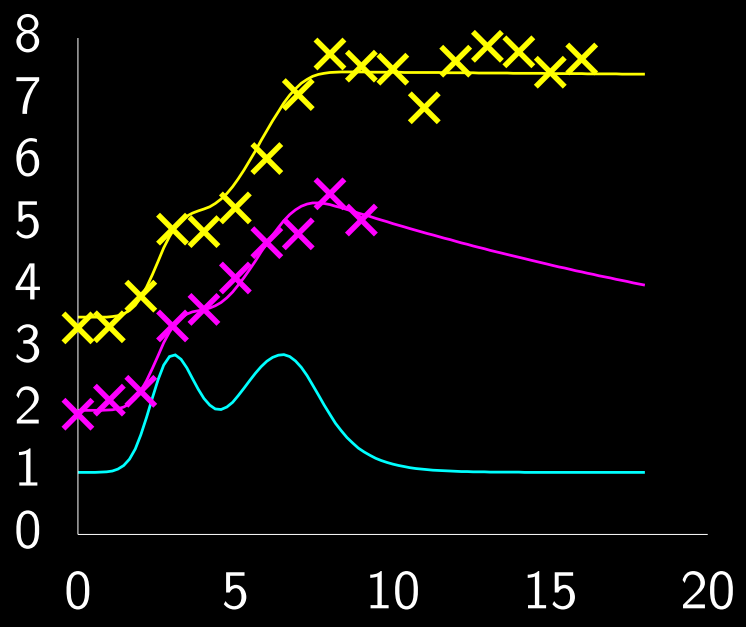
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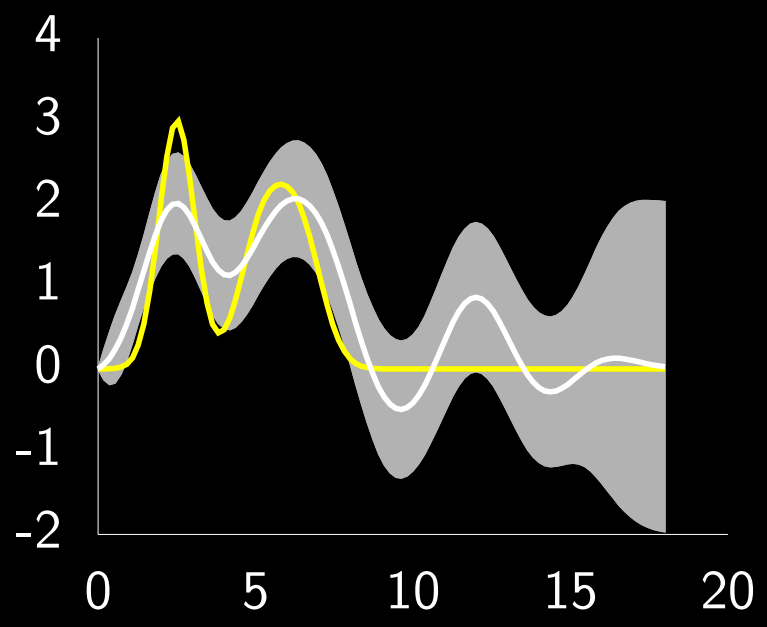
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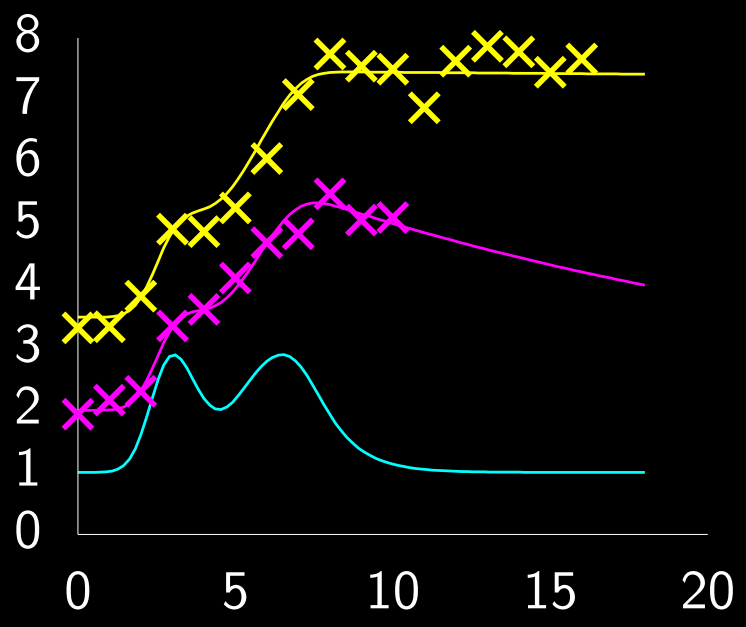
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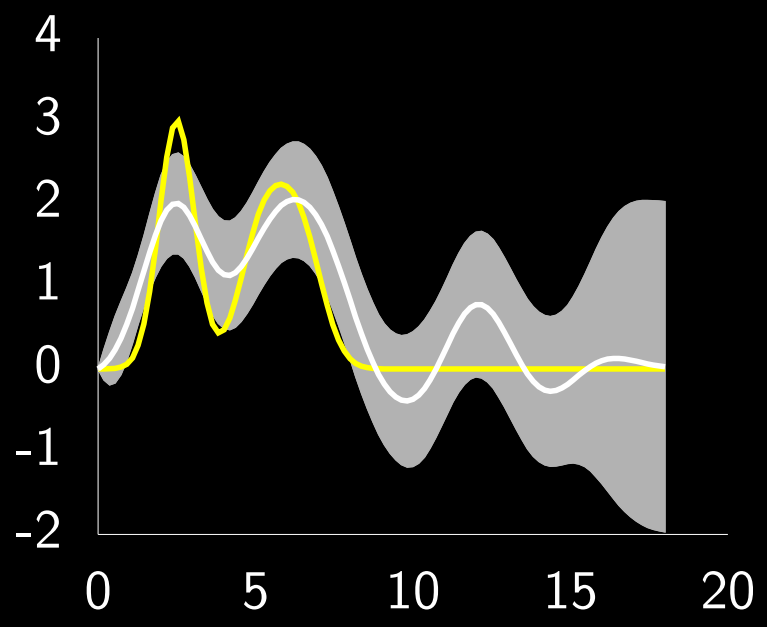
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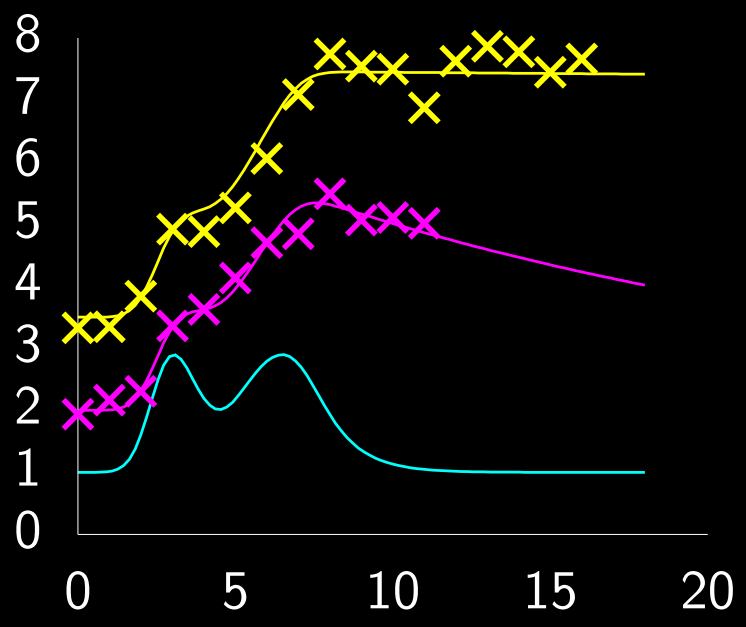
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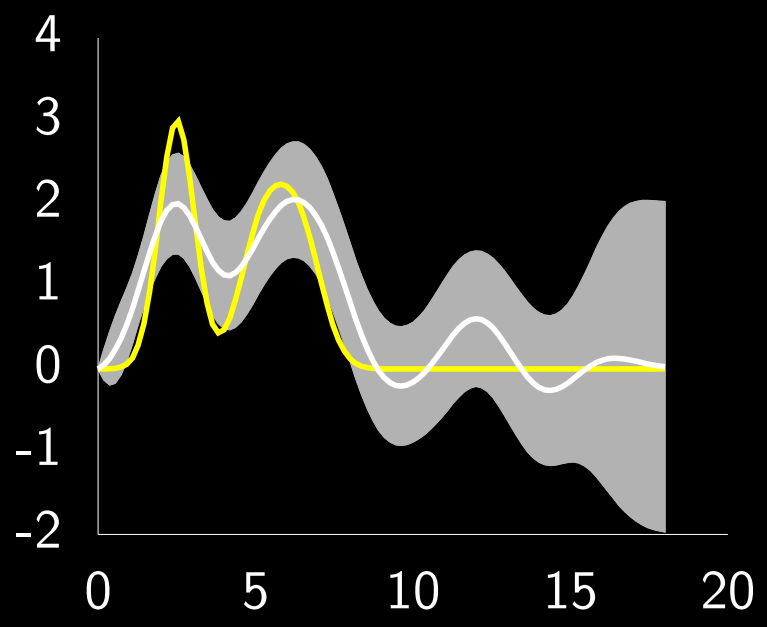
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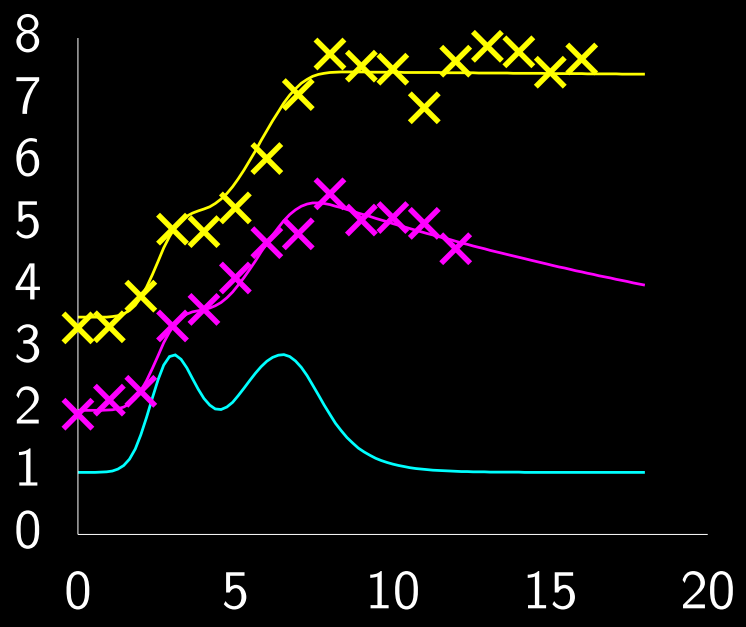
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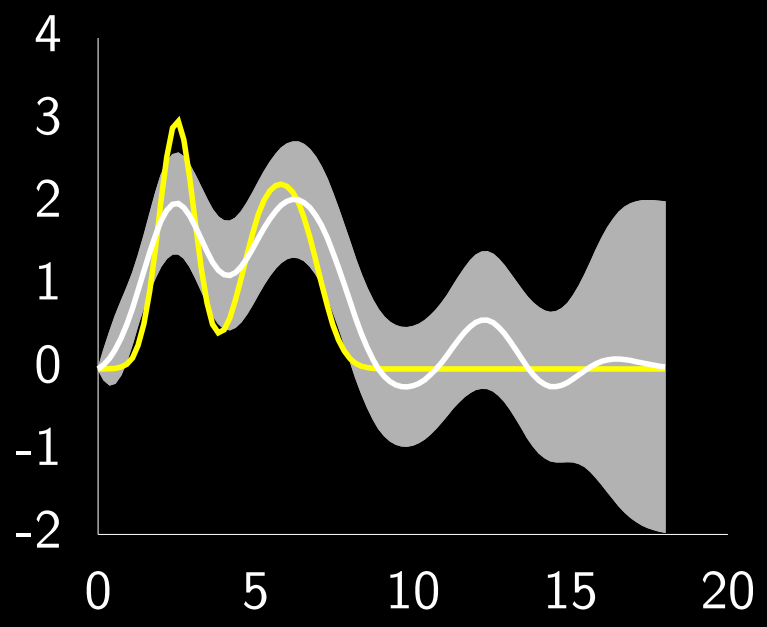
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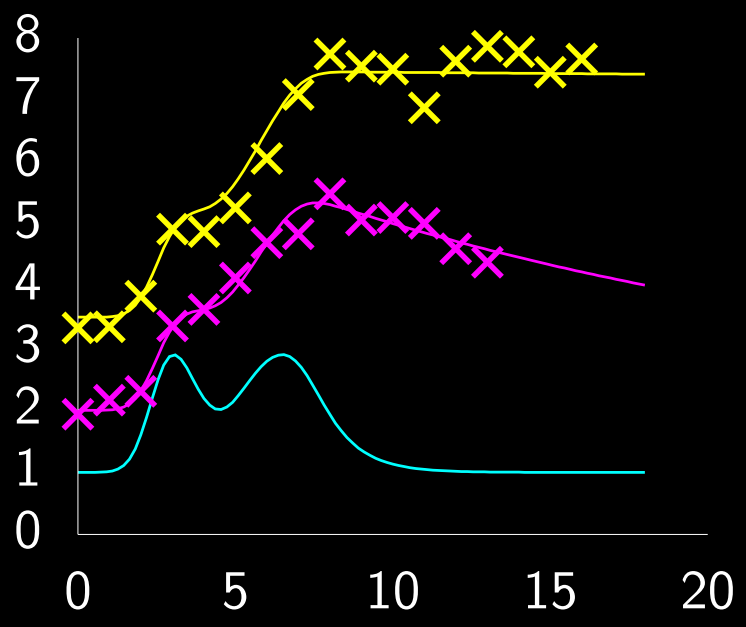
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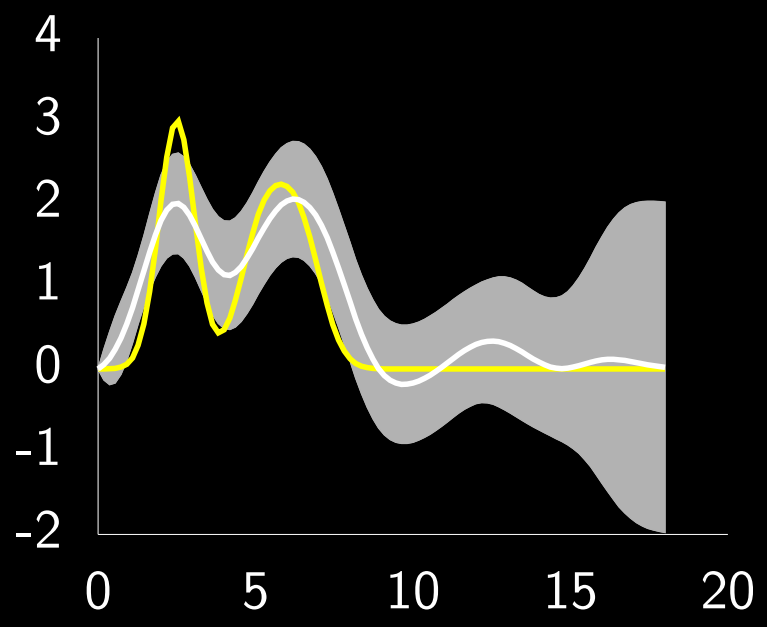
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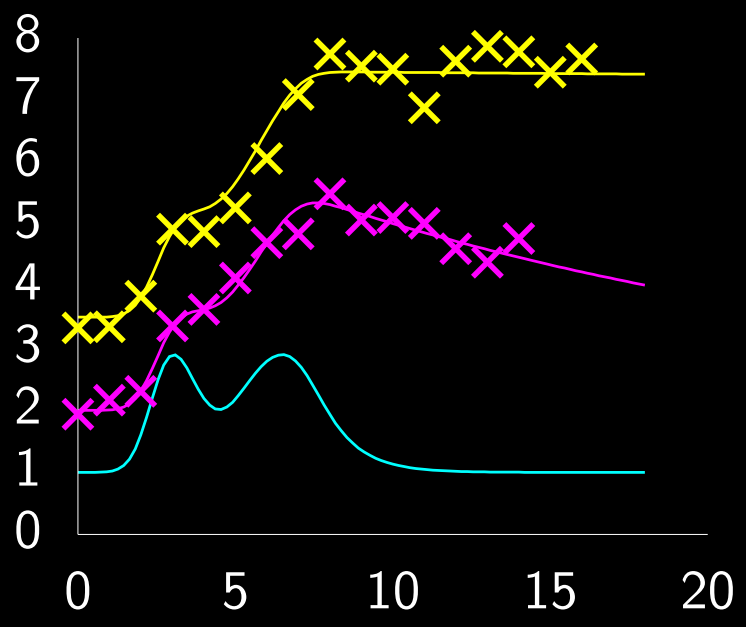
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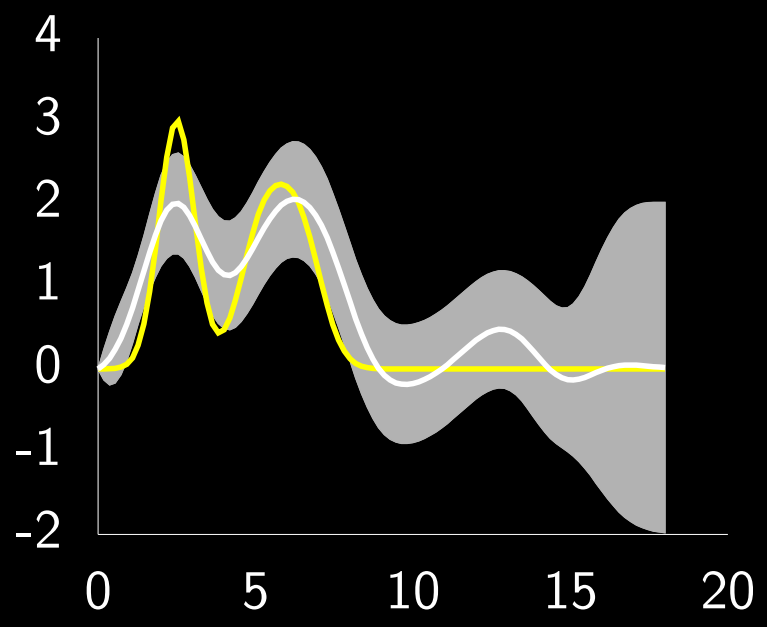
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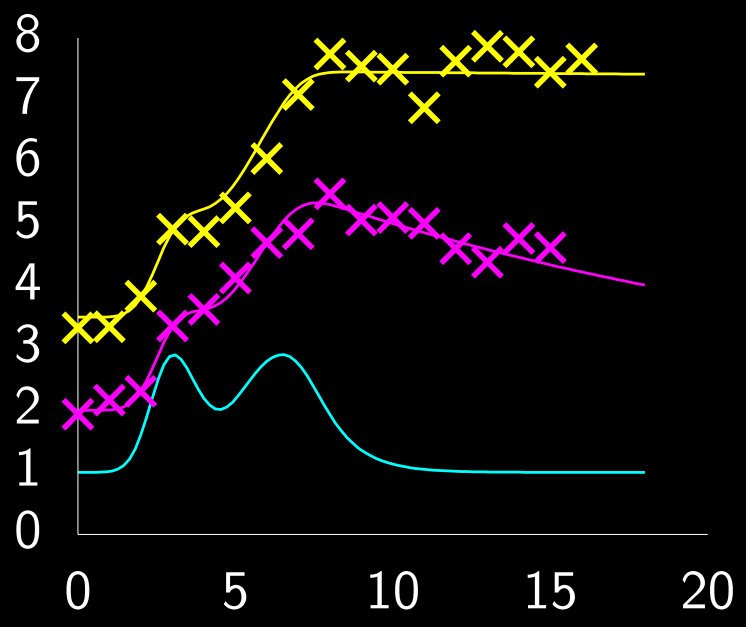
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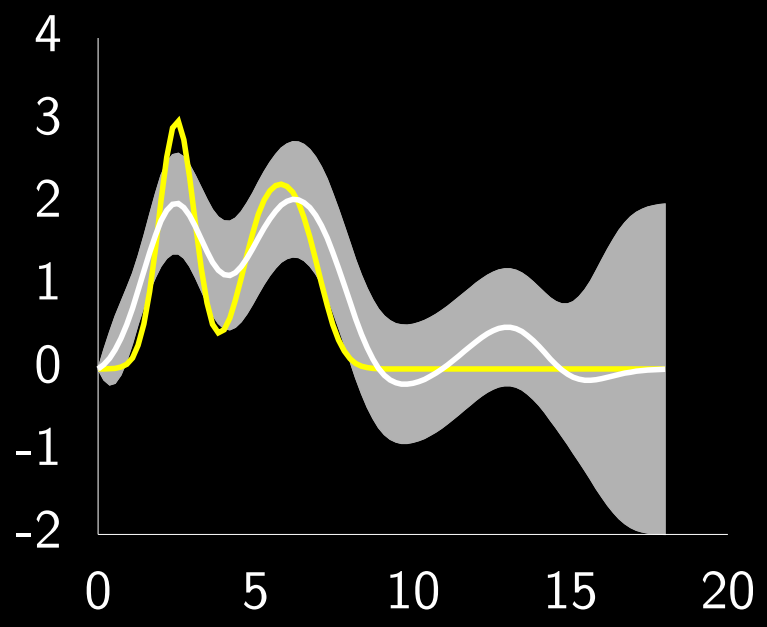
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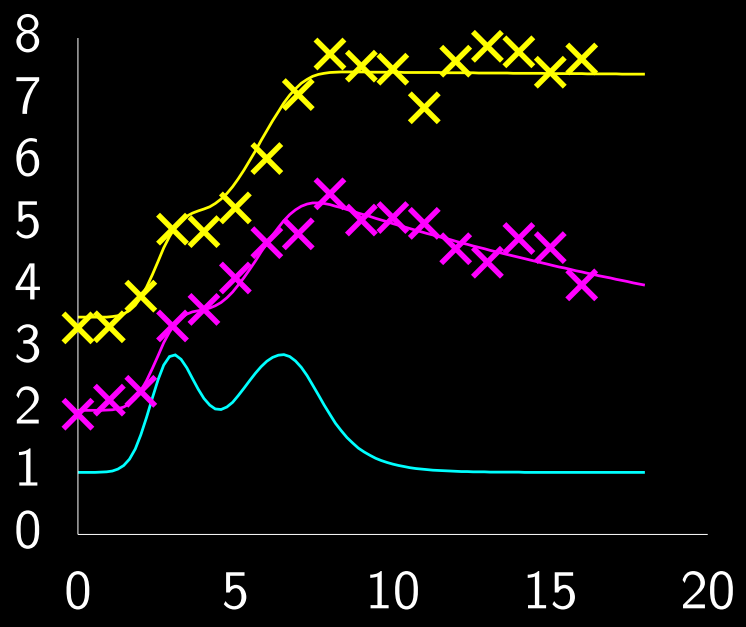
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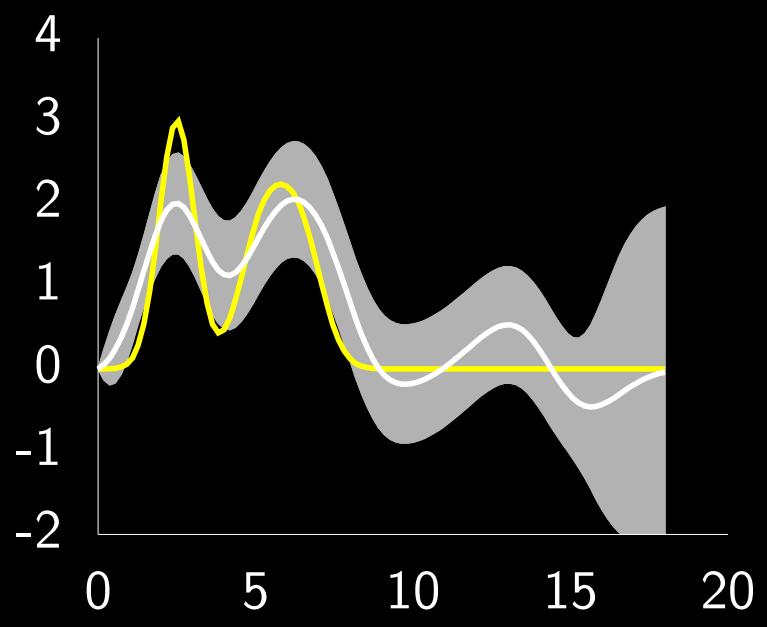
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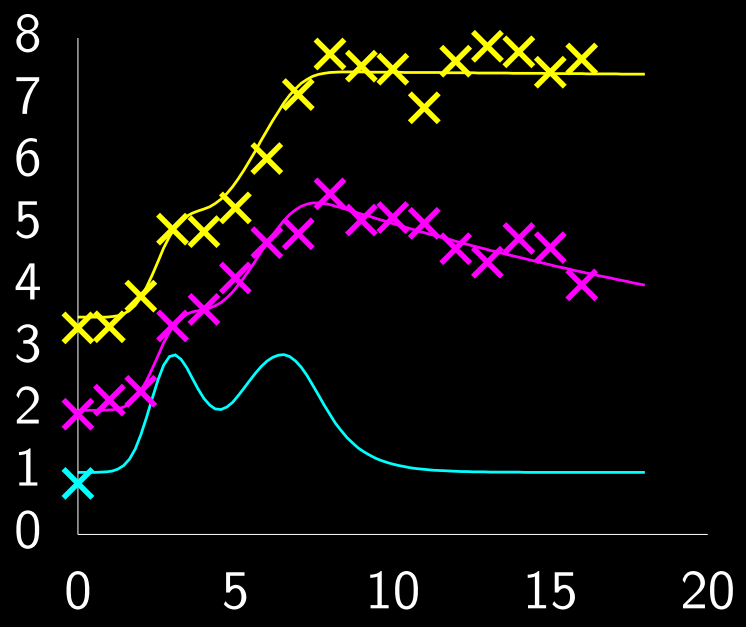
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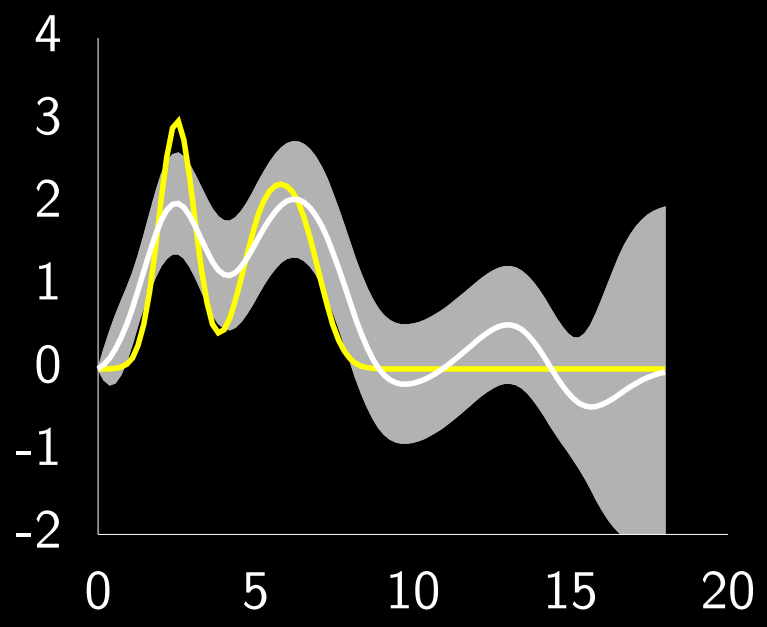
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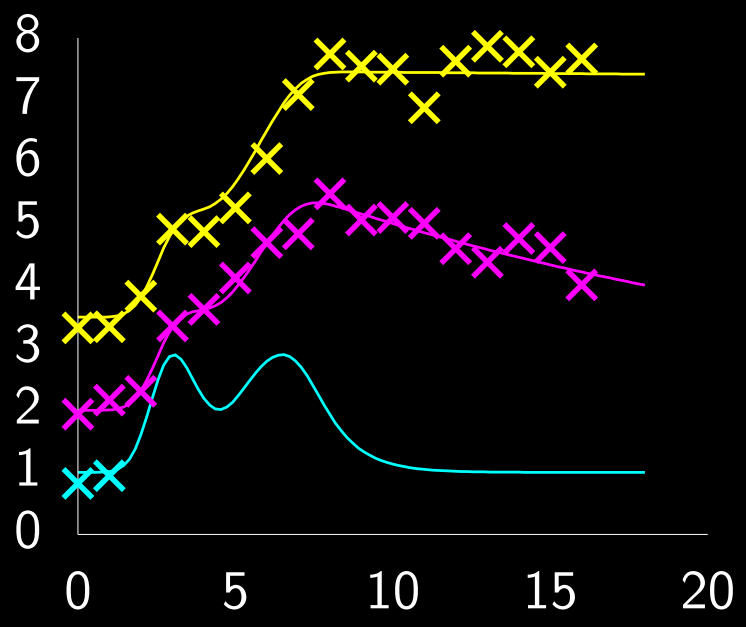
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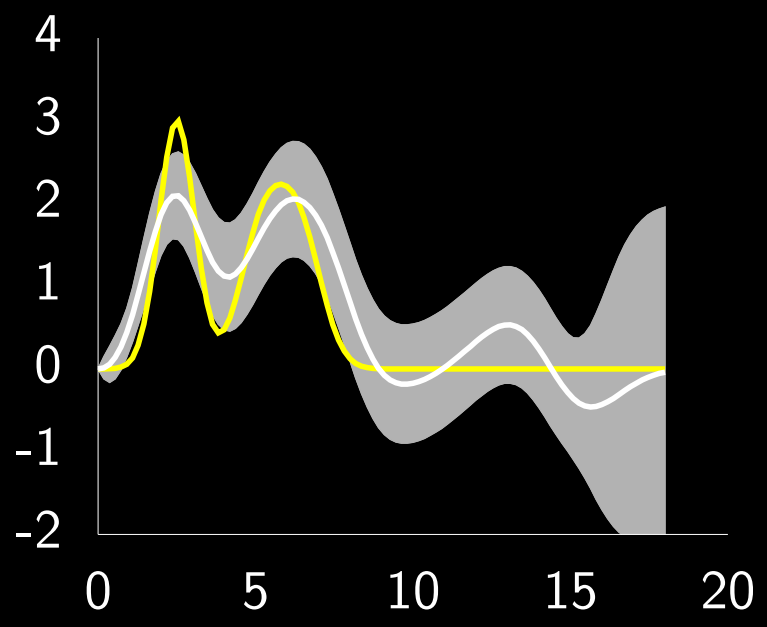
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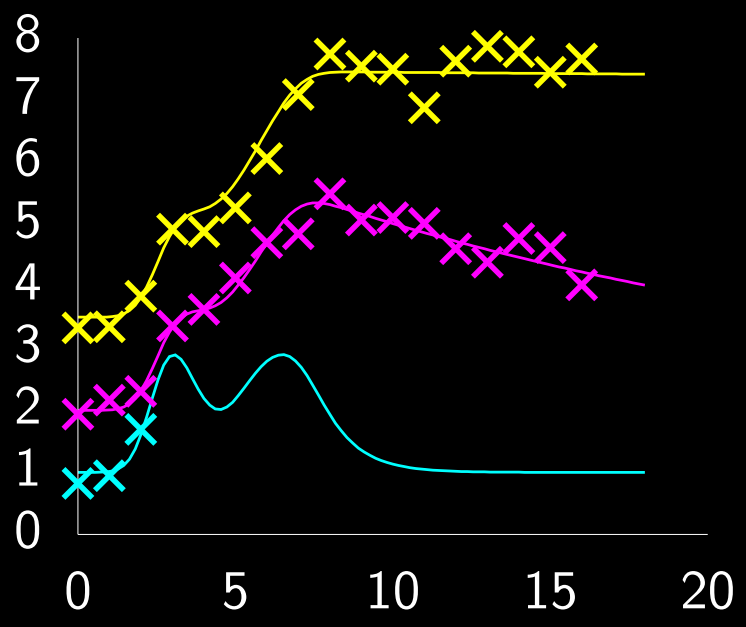
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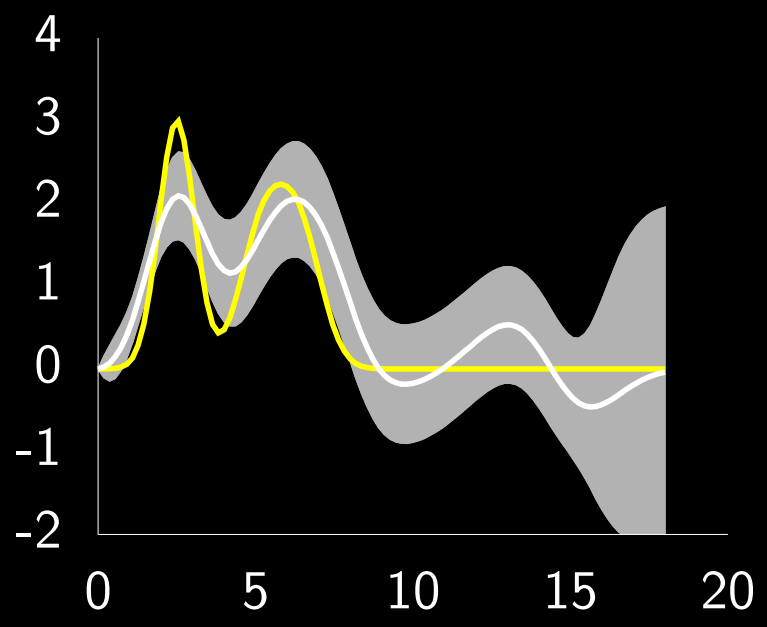
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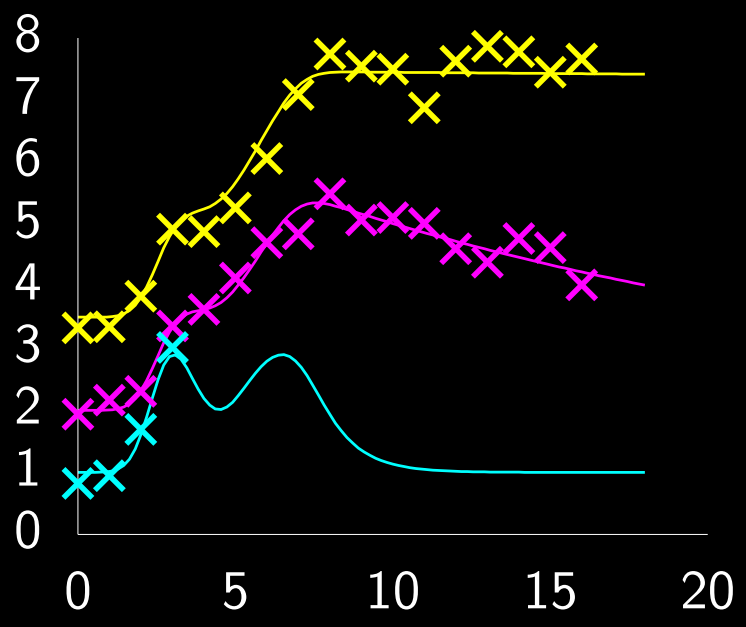
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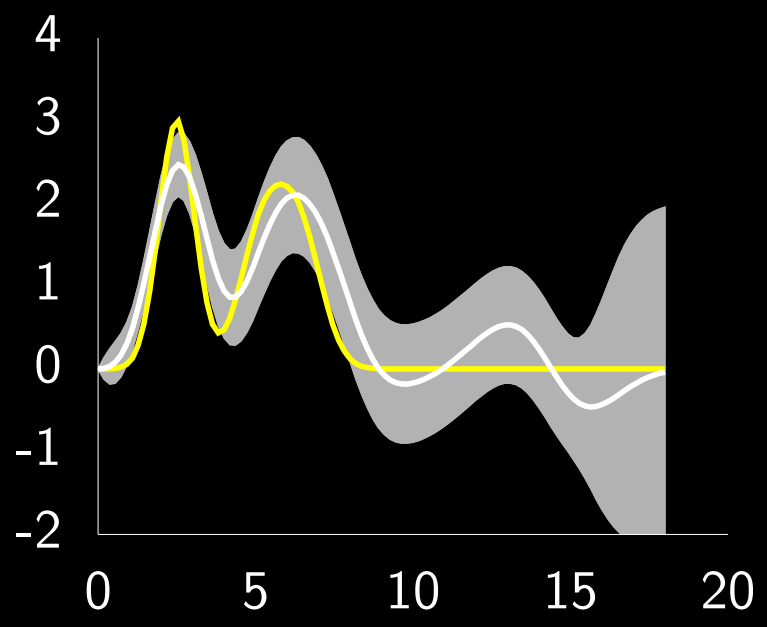
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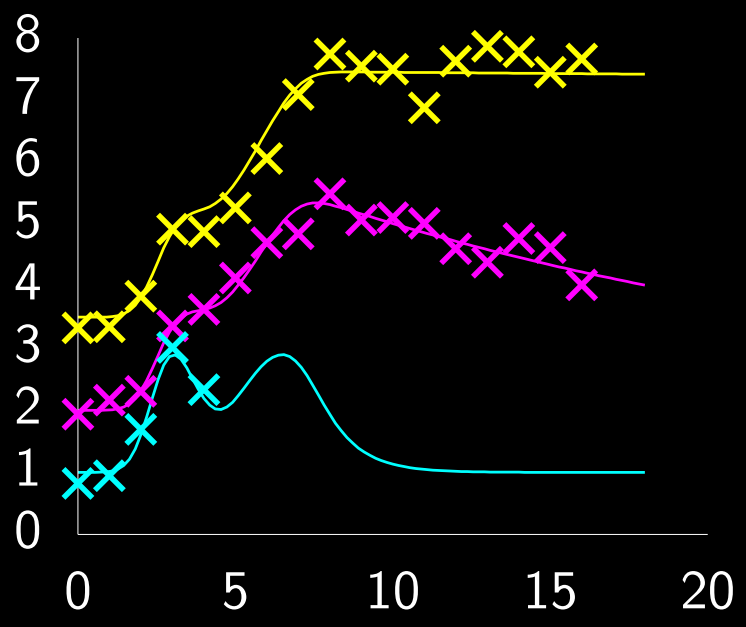
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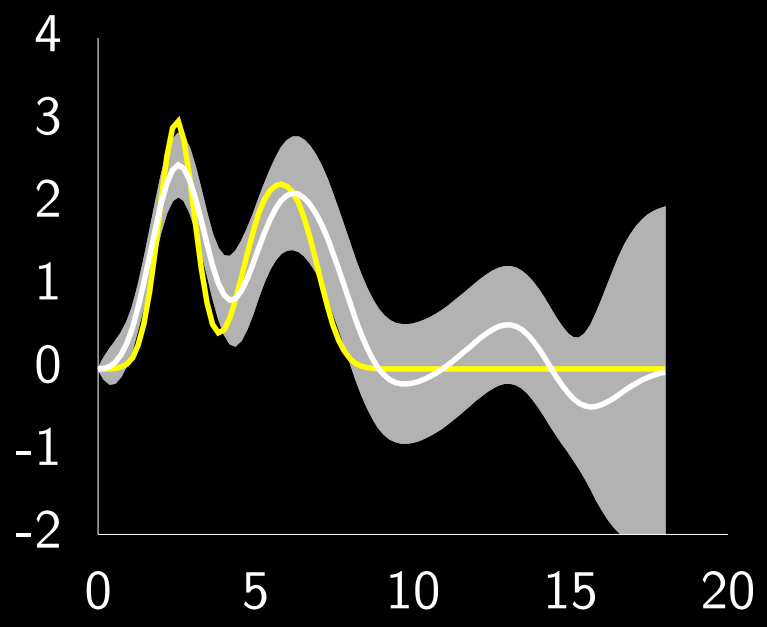
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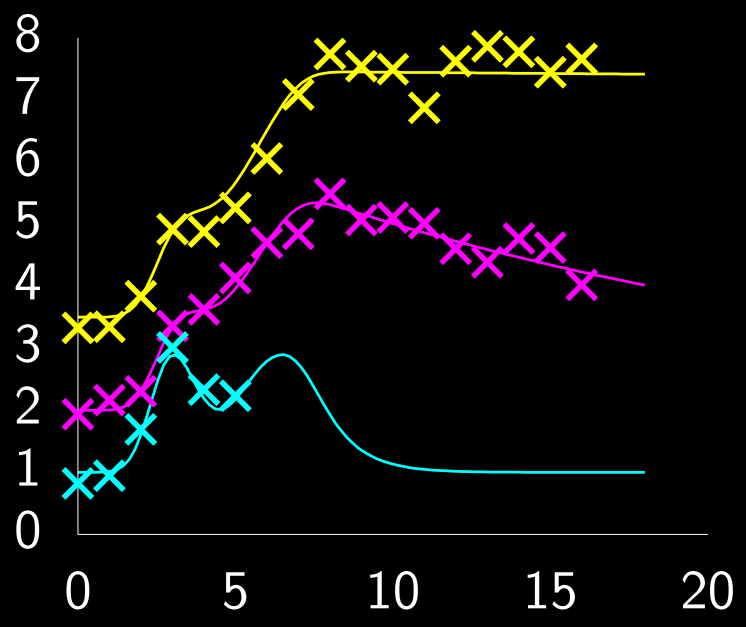
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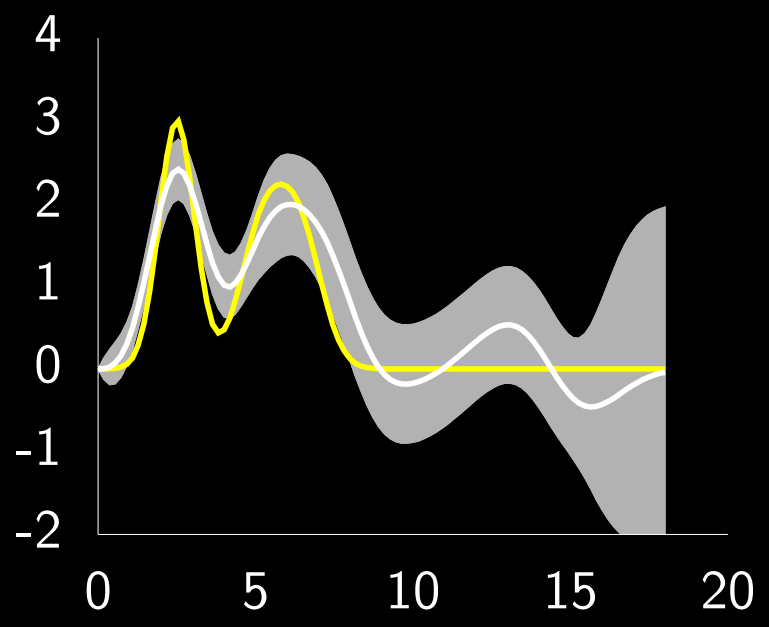
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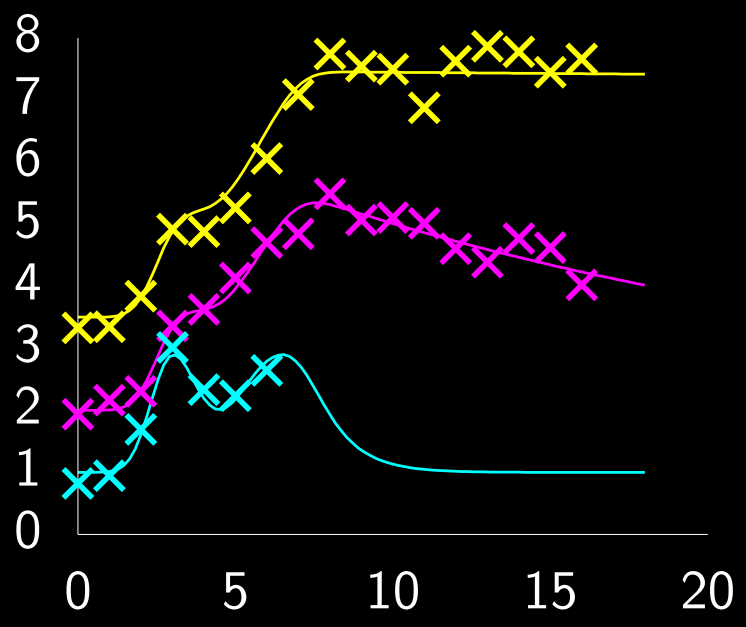
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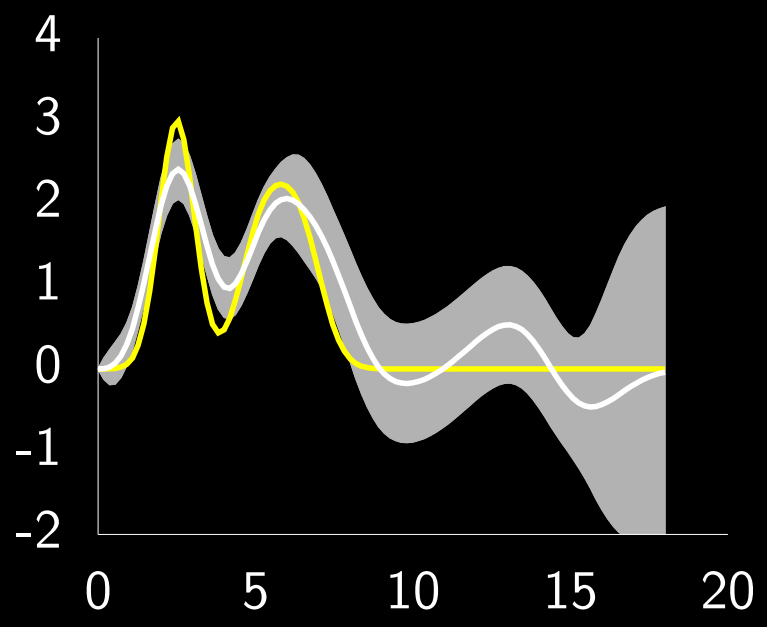
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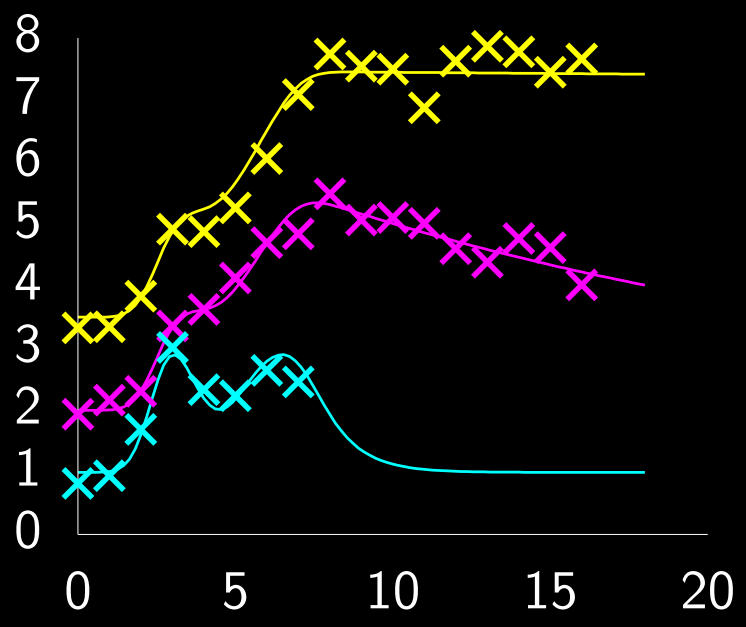
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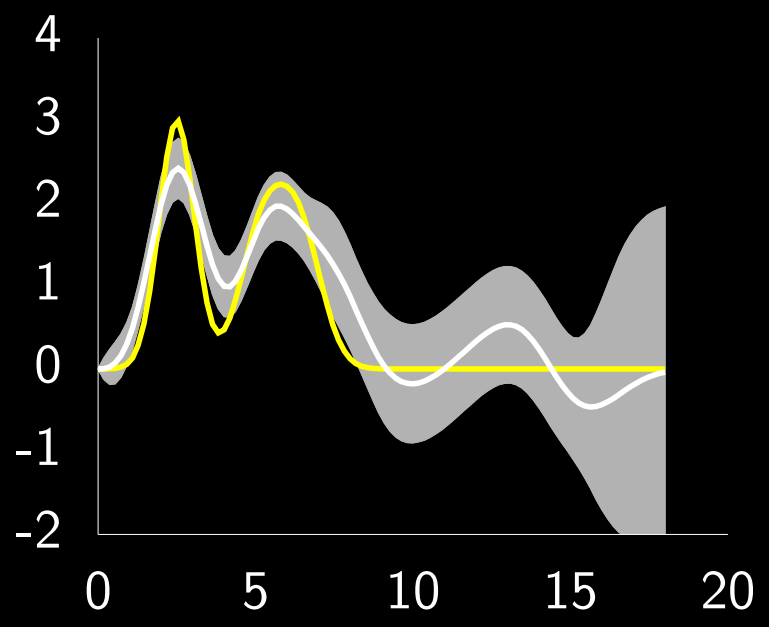
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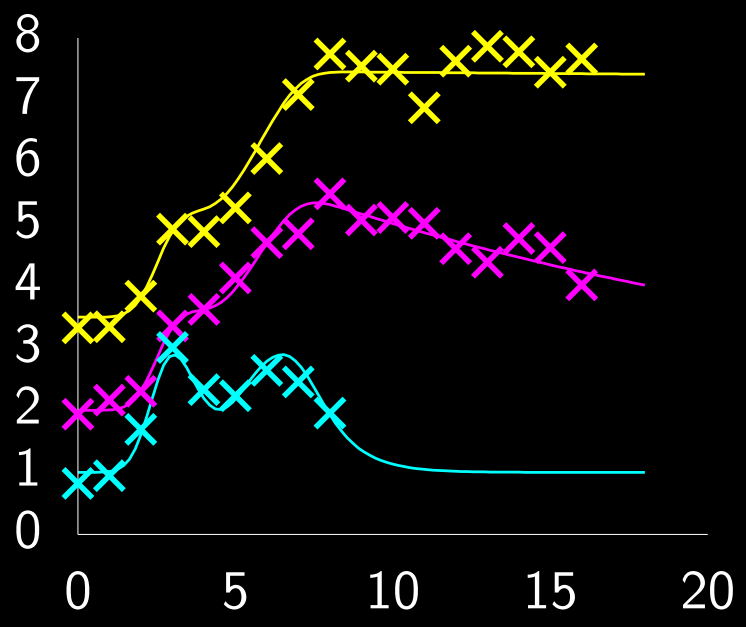
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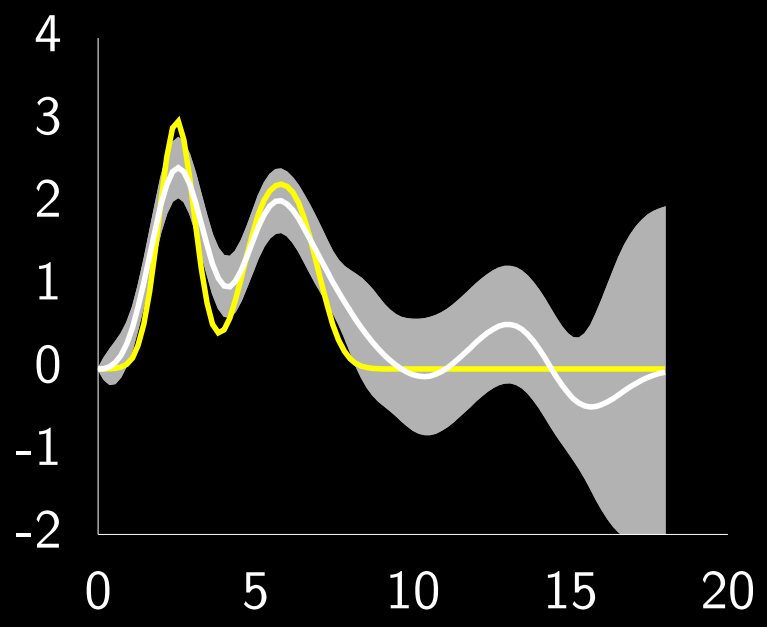
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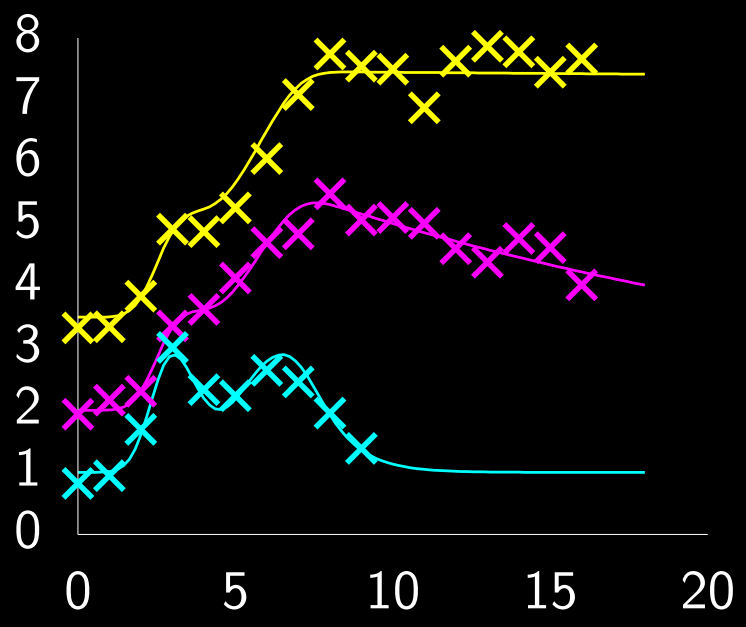
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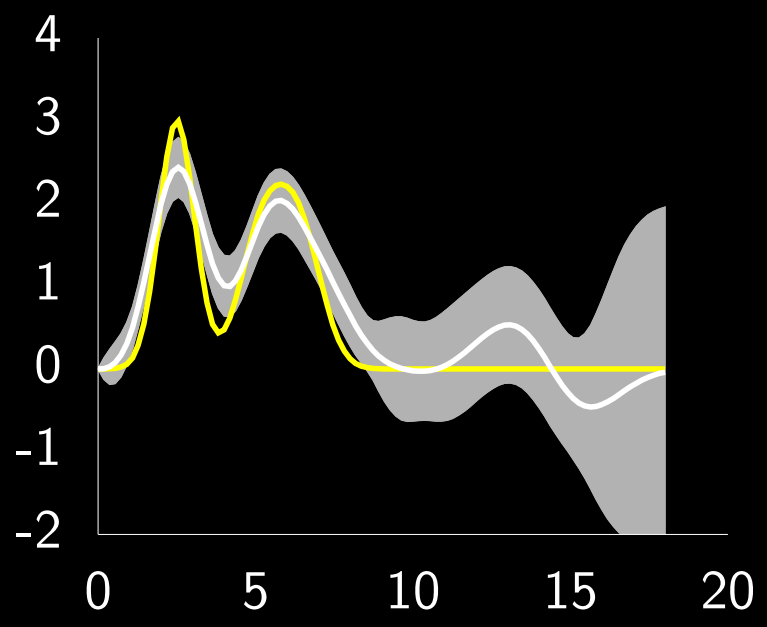
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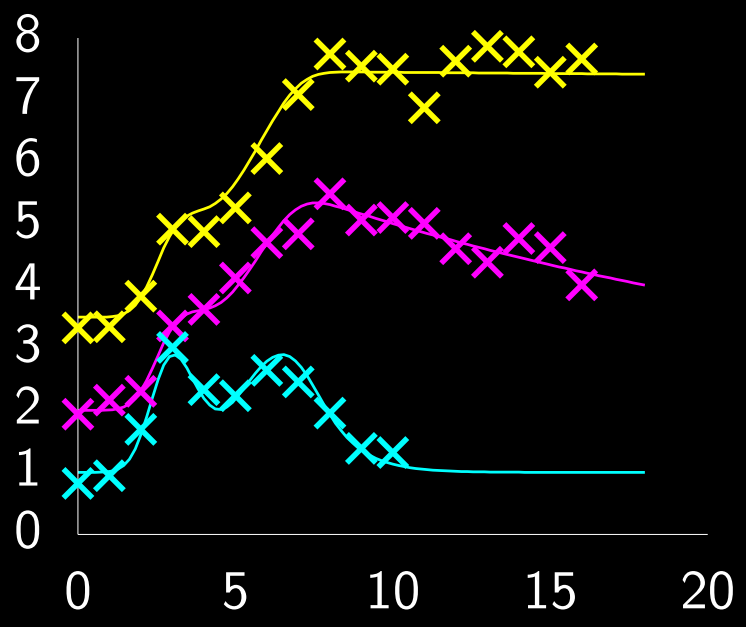
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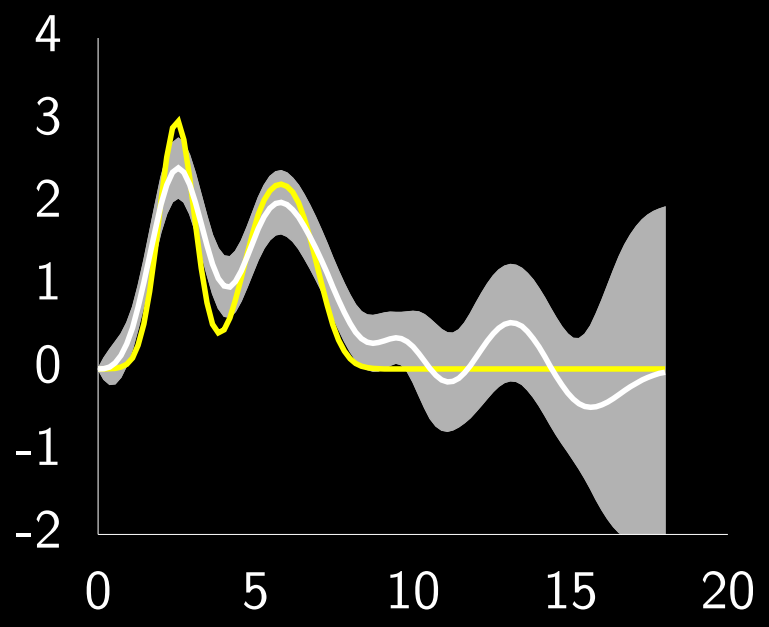
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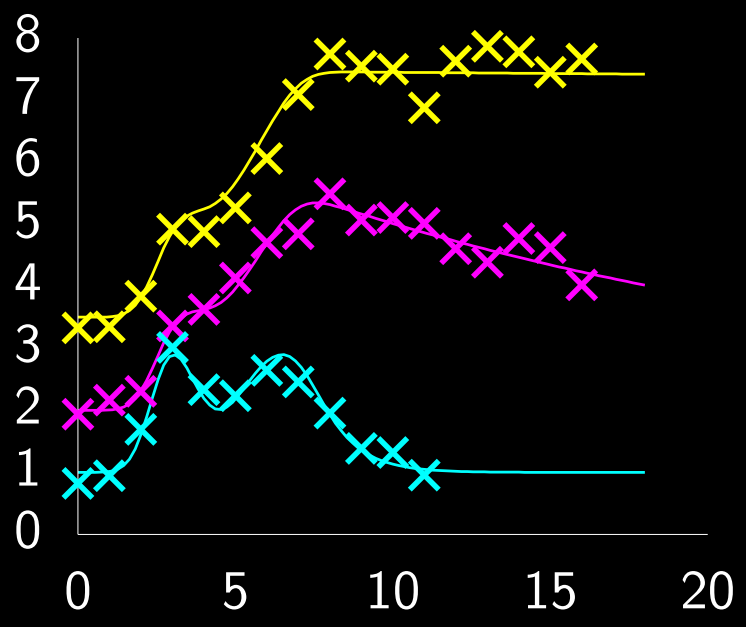
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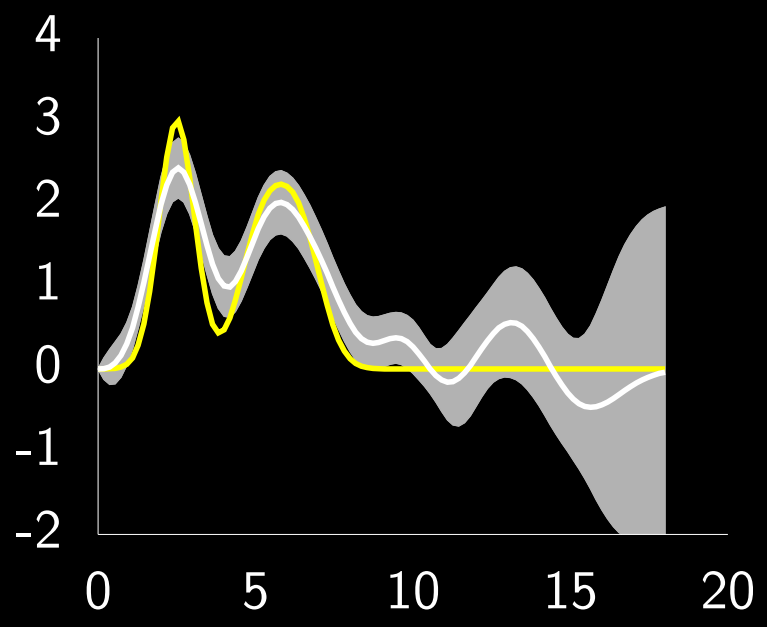
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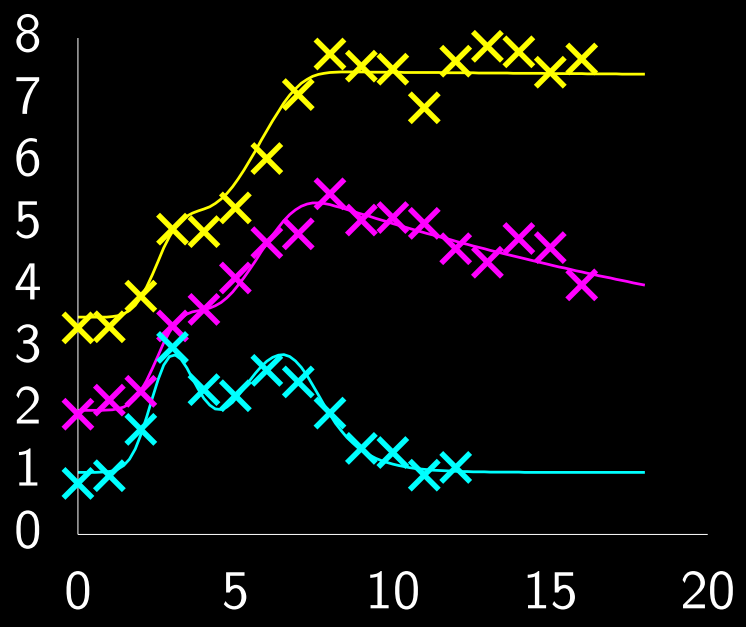
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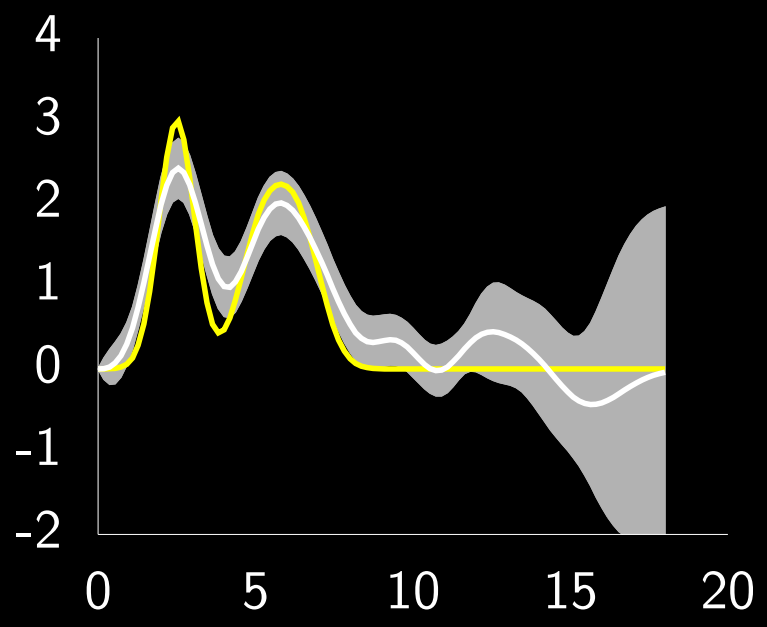
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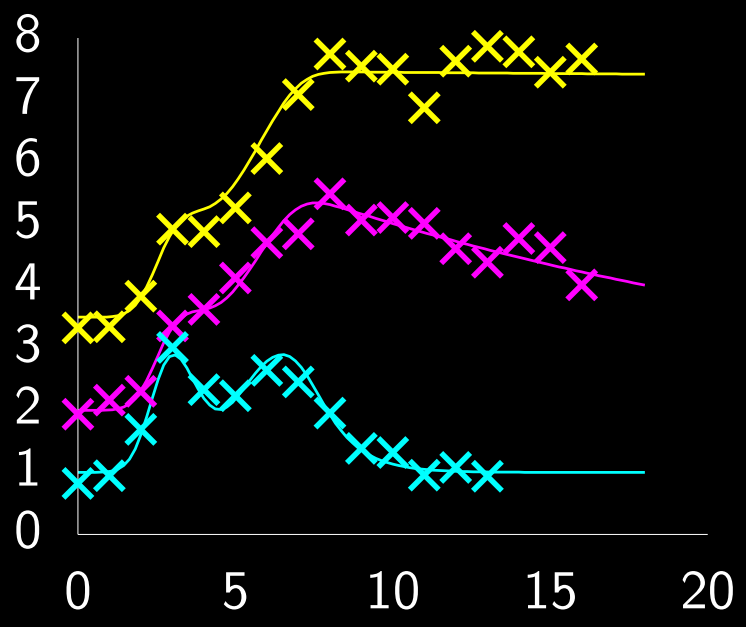
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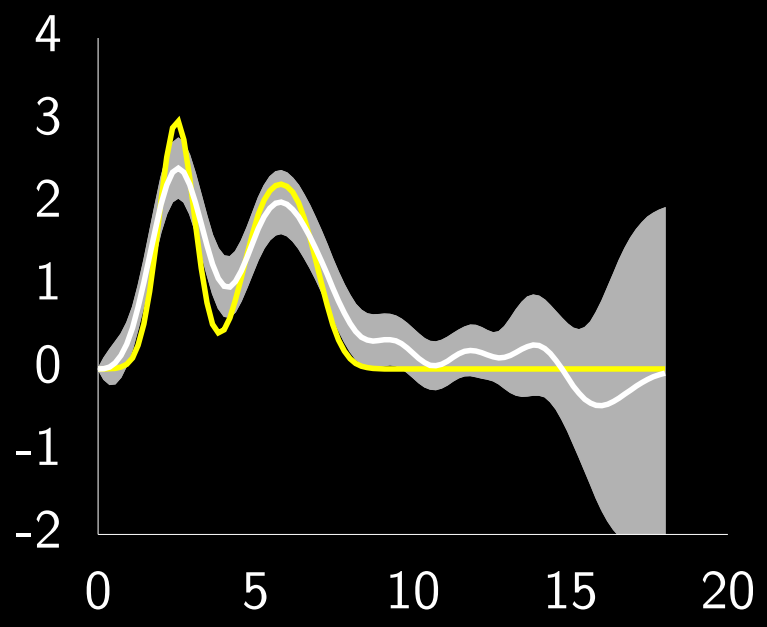
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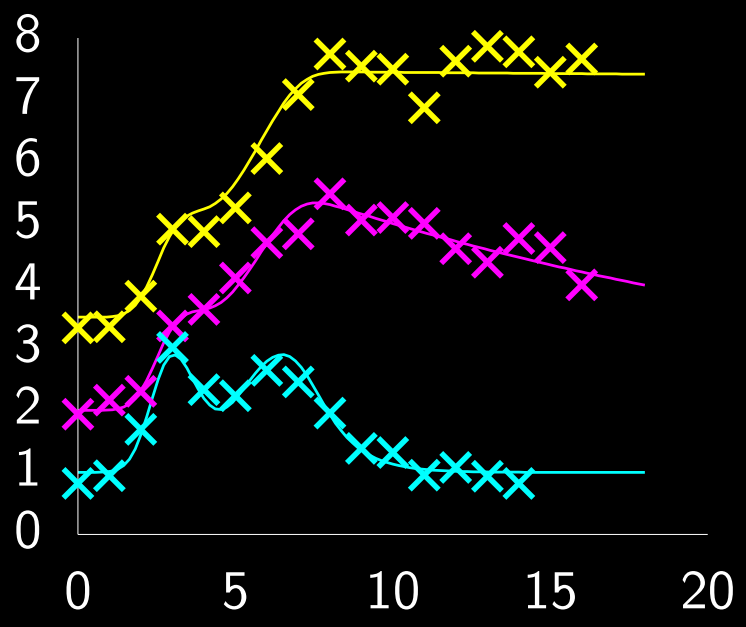
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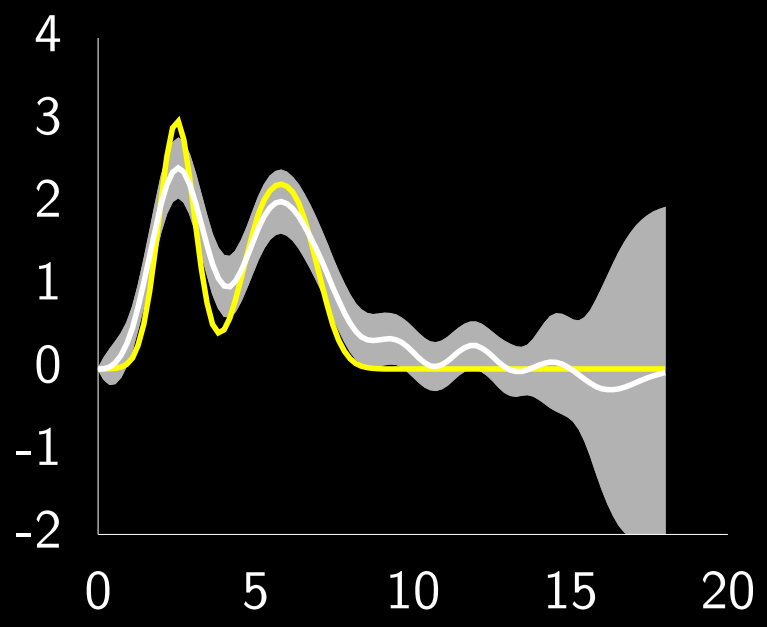
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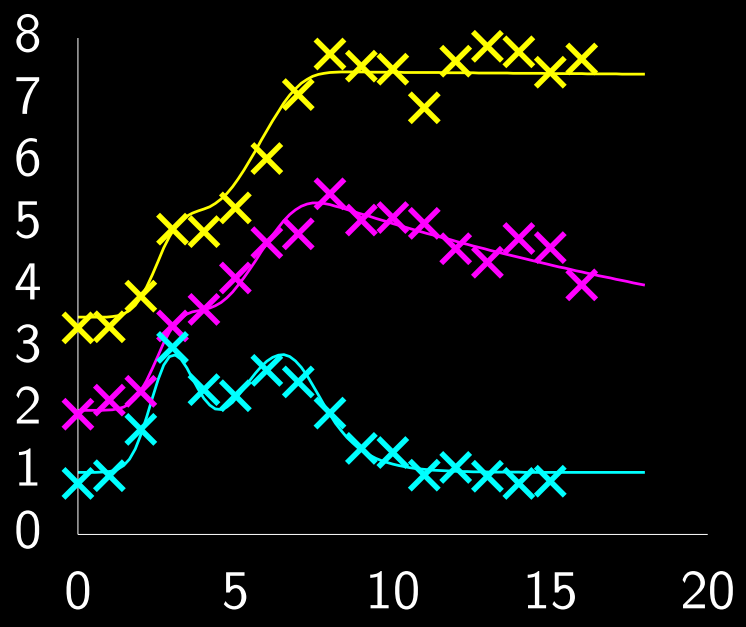
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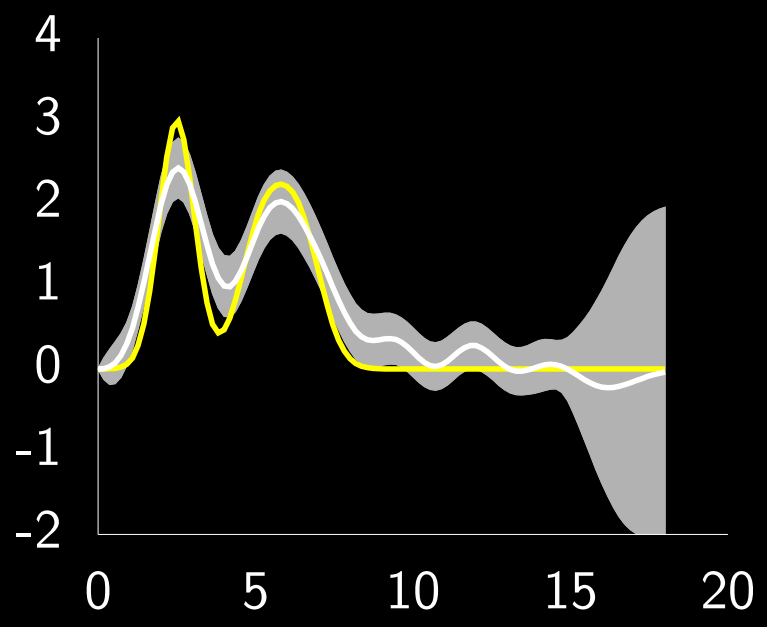
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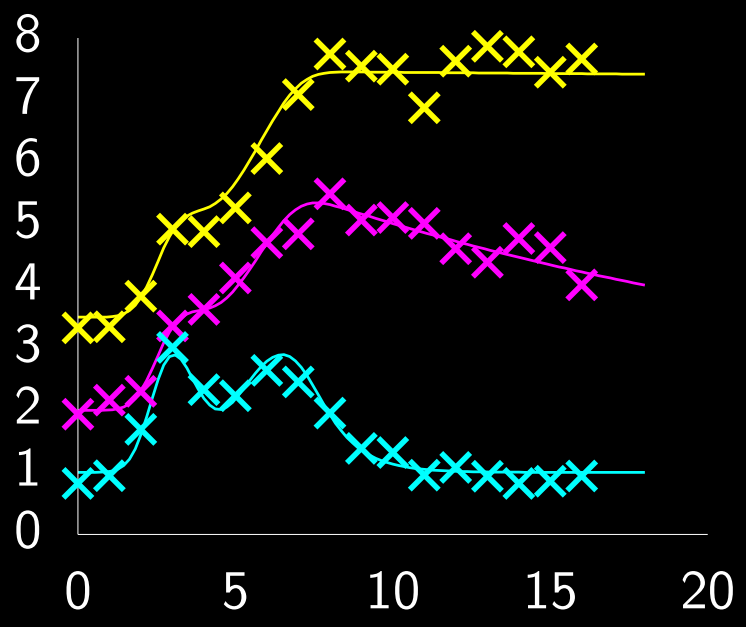
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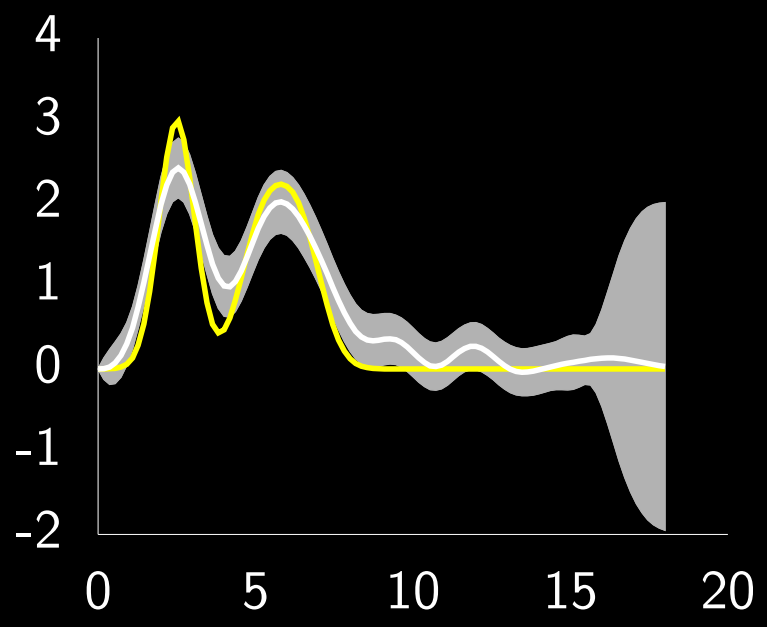
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