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GAN LEVEL 2 LSI OKINAWA BY GANBATTE

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13223095 - Muhammad Falih Rosyidi

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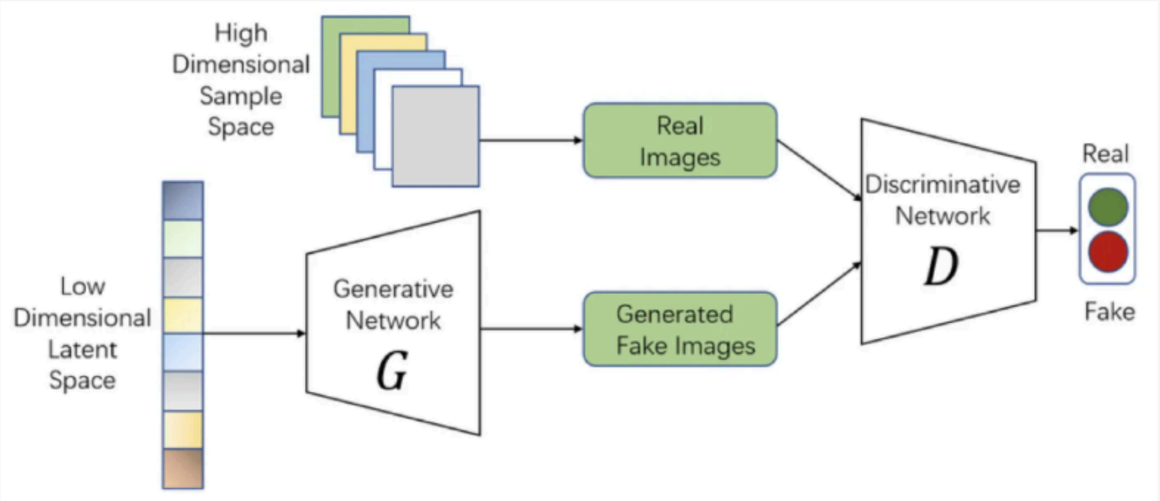
SPESIFIKASI GAN

- Implementasi Generator pada Hardware
- Implementasi Discriminator pada Hardware
- Training pada Software
- Terdapat 2 hasil training berbeda untuk dataset circle dan cross
- Terdapat input tambahan berupa choice untuk menghasilkan gambar berupa cirlce atau crosss



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SPESIFIKASI DATA

- Input Noise 32 Bit (Q8.24) berdimensi 2
- Input Choice (0 untuk circle dan 1 untuk cross
- Output 32 Bit (Q8.24)

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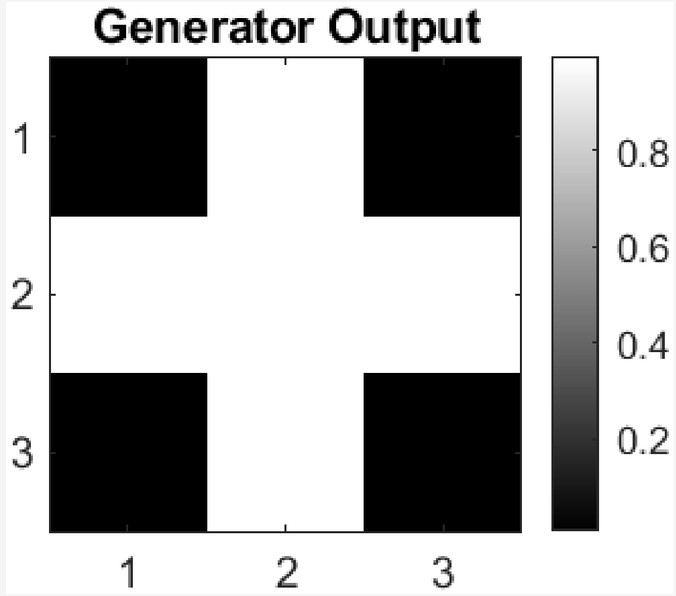
SIMULASI IDEAL

Data Keluaran Generator	Input
-0.978649513	[0,1] cross
0.981186978	
-0.978906909	
0.980476436	
0.979517399	
0.980026626	
-0.978727991	
0.97893142	
-0.98108159	

Data Keluaran Generator	Input
-0.978680288	[1,0] cross
0.981227316	
-0.979368207	
0.980299391	
0.979798576	
0.979791133	
-0.978940821	
0.979050434	
-0.981188626	



Data Keluaran Discriminator	Input
0.470764938554386	[0,1] cross
0.471072022546884	[1,0] cross

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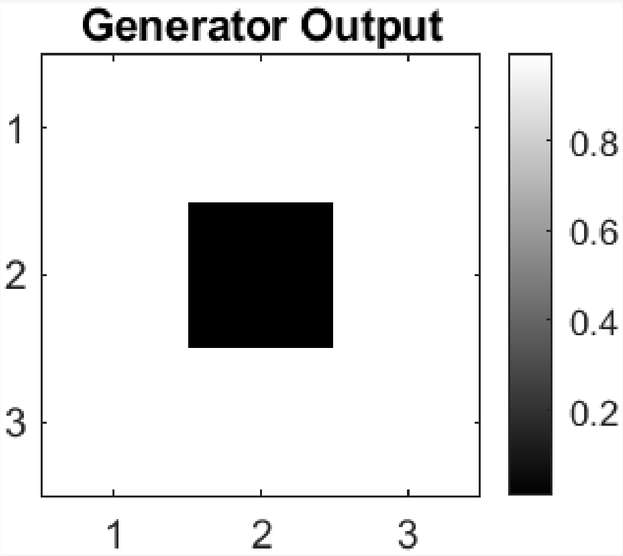
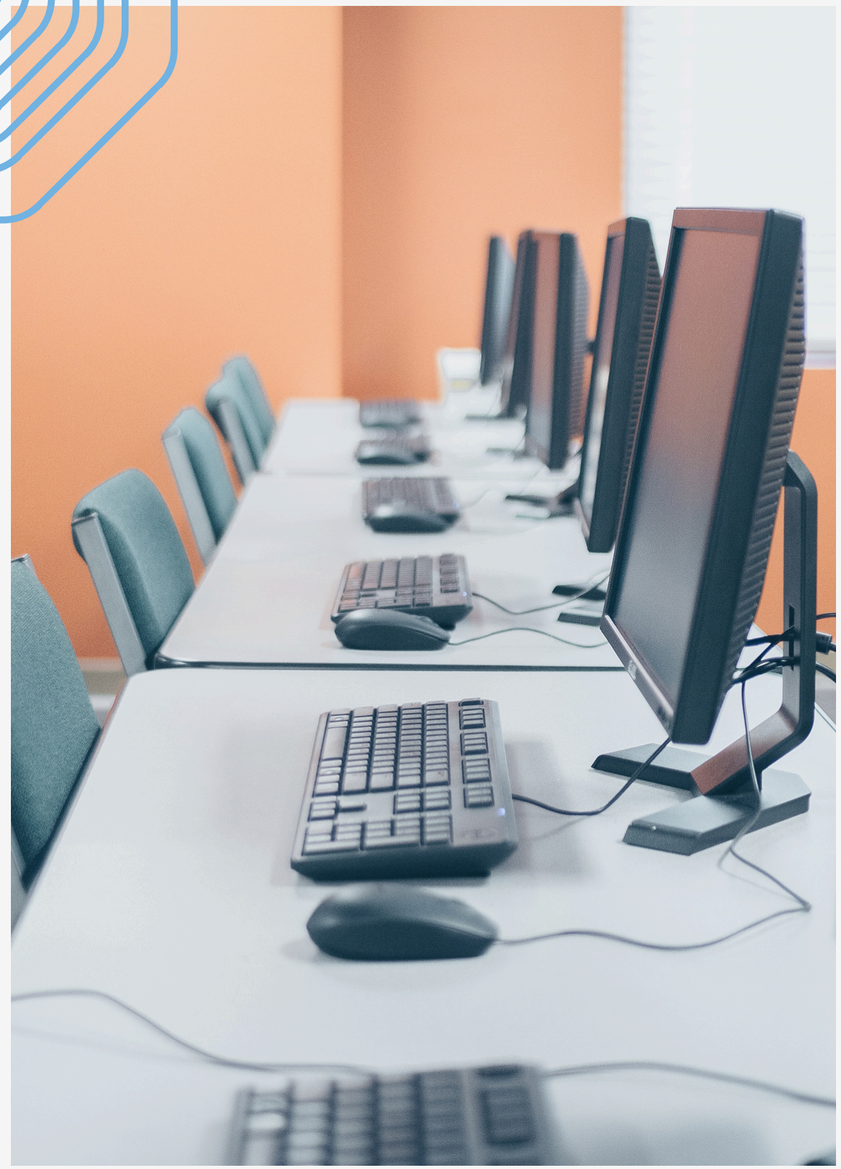
SIMULASI IDEAL

Data Keluaran Generator	Input
0.97730843	[0,1] circle
0.97850035	
0.977053394	
0.978896316	
-0.979320197	
0.979678339	
0.978920315	
0.980463748	
0.978954222	

Data Keluaran Generator	Input
0.977036041	[1,0] circle
0.978064773	
0.976811221	
0.979013435	
-0.979210132	
0.979879117	
0.978450018	
0.980784571	
0.979340317	



Data Keluaran Discriminator	Input
0.470996508933822	[0,1] circle
0.47080308116633	[1,0] circle



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PENDEKATAN FUNGSI AKTIVASI

Fungsi aktivasi tanh dan sigmoid tidak bisa direalisasikan secara penuh sehingga dilakukan pendekatan .

Tanh diaproksimasi dengan Piecewise Quadratic

Sigmoid diaproksimasi dengan Piecewise Linear

PENDEKATAN FUNGSI AKTIVASI TANH

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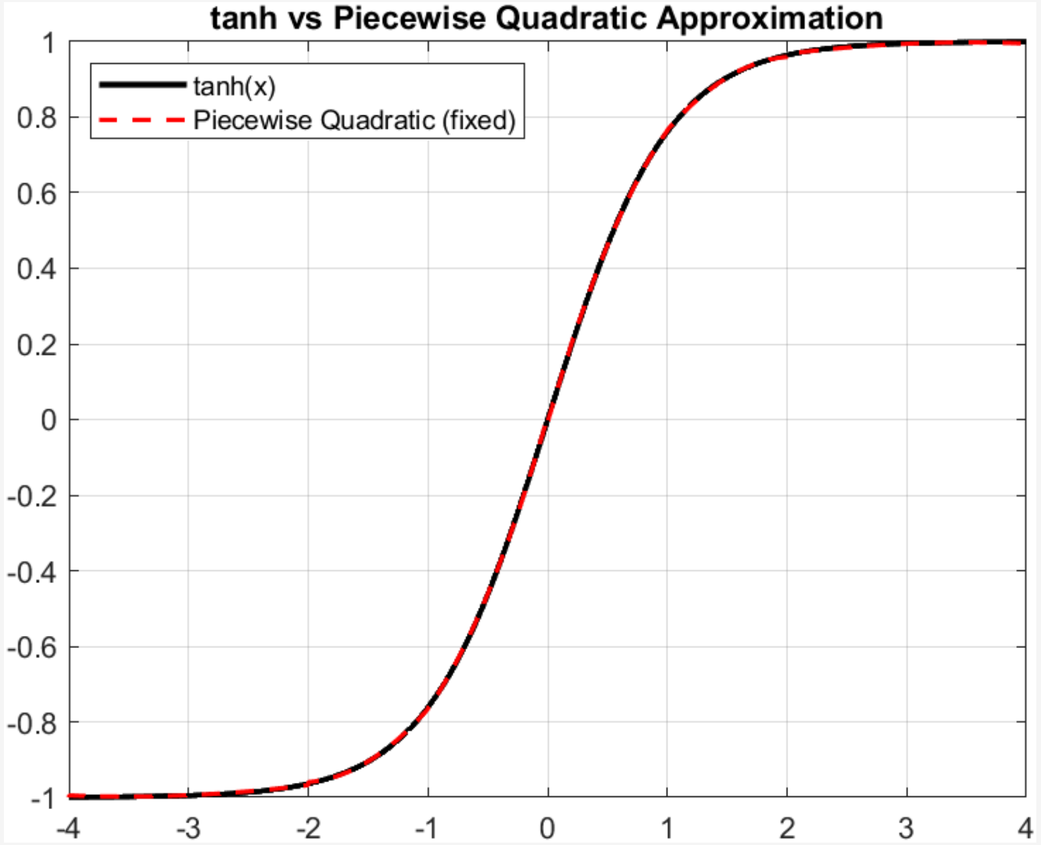

Fungsi tanH diaproksimasi dengan metode piecewise kuadratik. TanH dibagi menjadi 4 segmen dan dicerminkan terhadap titik origin:

- $|x| < 1$
  $y = -0.330005x^2 + 1.101576x - 0.006996$
- $1 <= |x| < 2$
  $y = -0.168637x^2 + 0.699828x + 0.234964$
- $2 <= |x| < 4$
  $y = -0.012845x^2 + 0.091424x + 0.836701$
- $|x| >= 4$
  $y = 1$

PENDEKATAN FUNGSI AKTIVASI TANH

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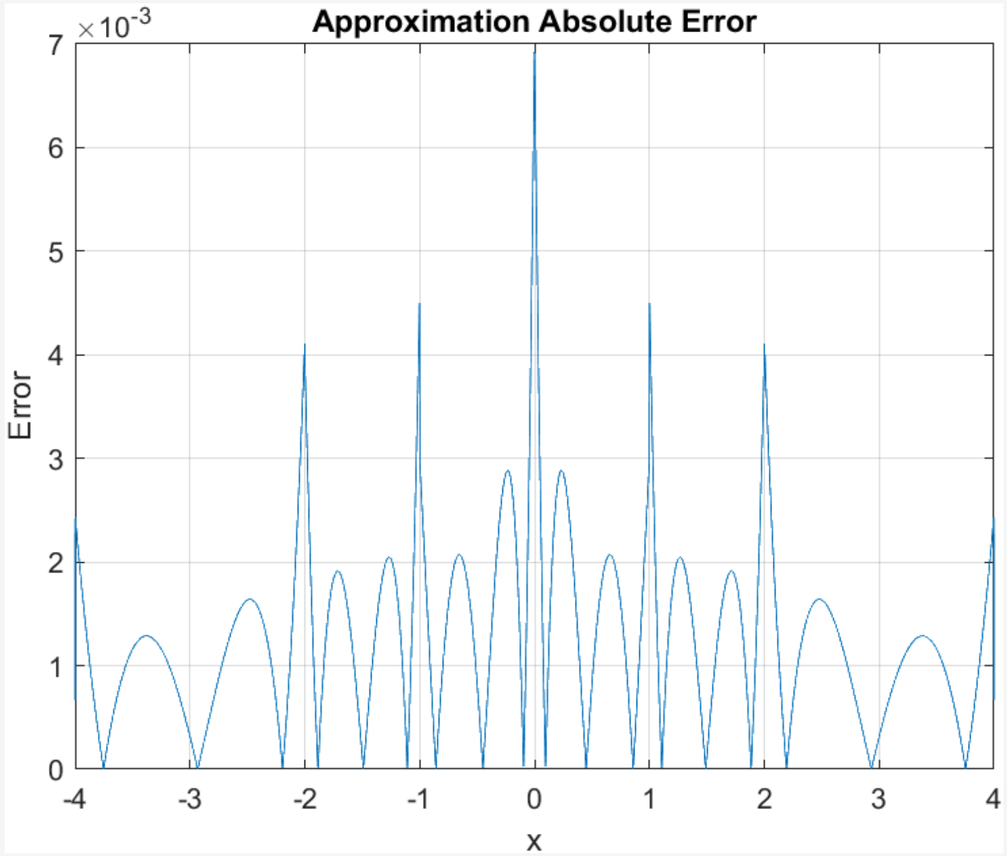

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PENDEKATAN FUNGSI AKTIVASI SIGMOID

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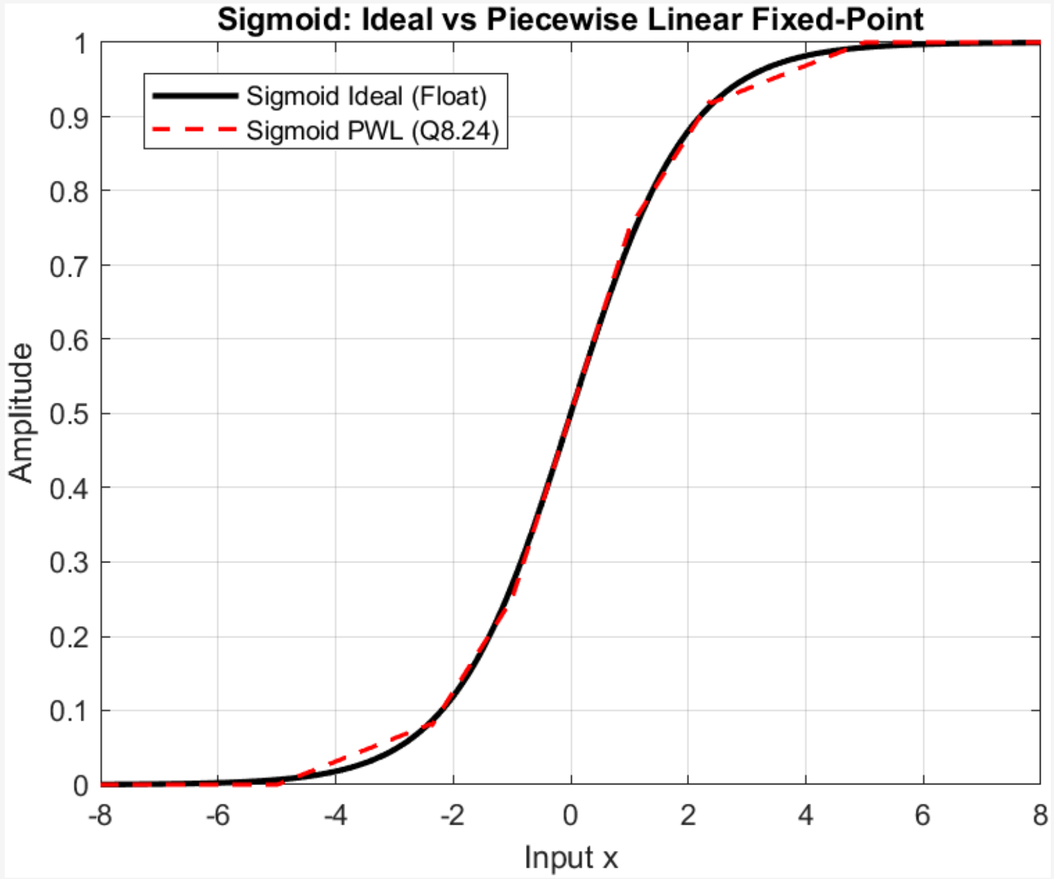

Fungsi sigmoid diaproksimasi dengan metode piecewise linear. Sigmoid dibagi menjadi 4 segmen dan dicerminkan terhadap titik (0,0.5):

- |x| < 1
  y = 0.25x + 0.5
- 1 <= |x| < 2.375
  y = 0.125x + 0.625
- 2 <= |x| < 5
  y = 0.03125x + 0.84375
- |x| >= 5
  y = 1

PENDEKATAN FUNGSI AKTIVASI SIGMOID

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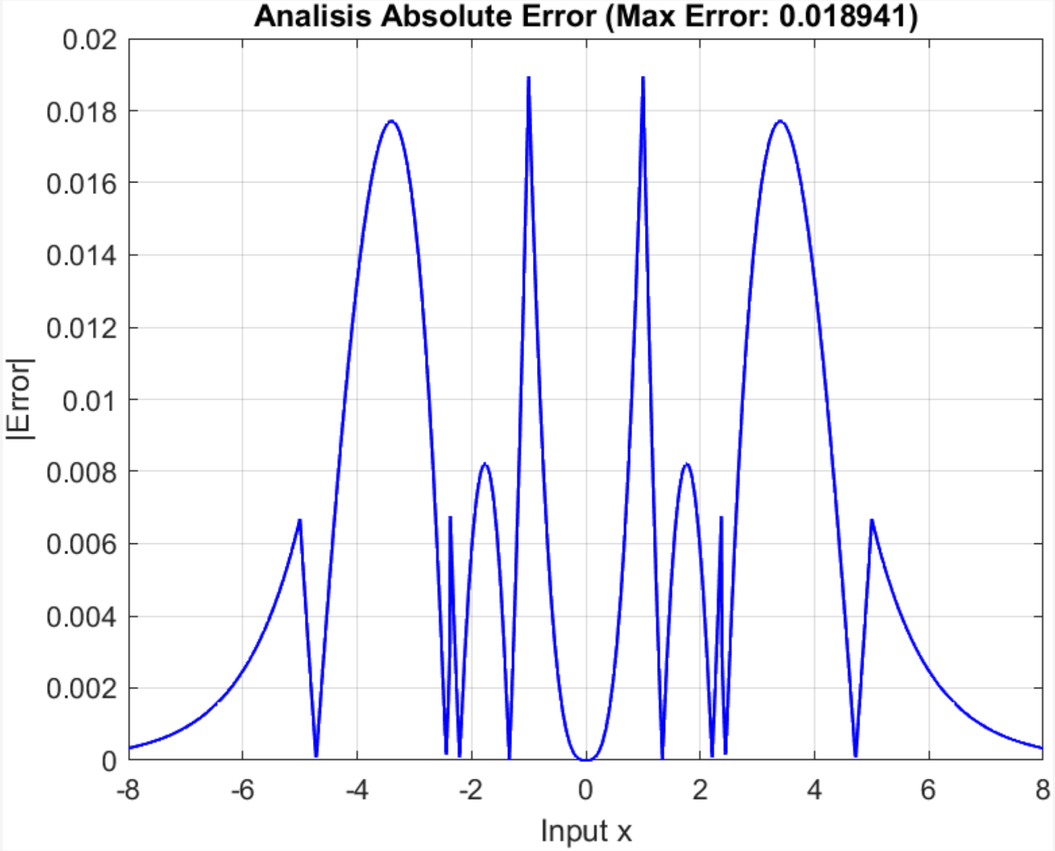

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- 2 <= |x| < 5
  y = 0.03125x + 0.84375
- |x| >= 5
  y = 1

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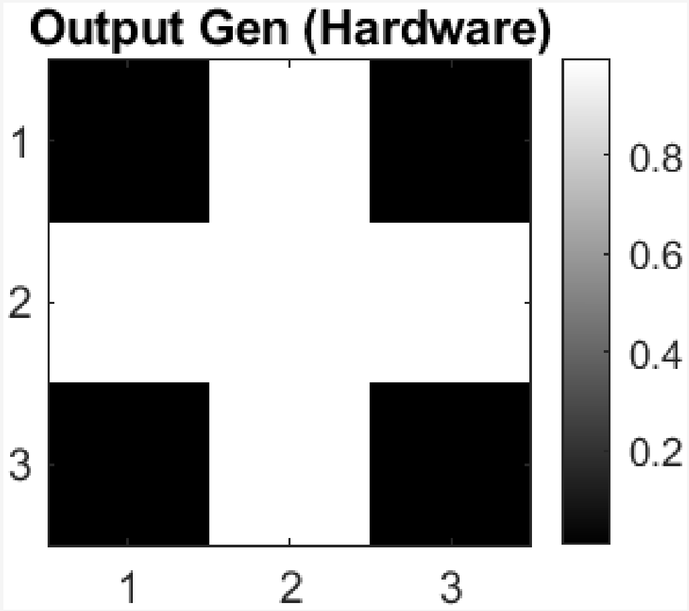
SIMULASI TEST VECTOR PADA SOFTWARE

Data Keluaran Generator	Input
-0.977812843	[0,1] cross
0.979887843	
-0.97799125	
0.97929738	
0.978488112	
0.9789299	
-0.977859003	
0.97802528	
-0.9797976	

Data Keluaran Generator	Input
-0.977835831	[1,0] cross
0.979920463	
-0.978353163	
0.979152031	
0.978710888	
0.978739988	
-0.978023582	
0.978117408	
-0.979886092	



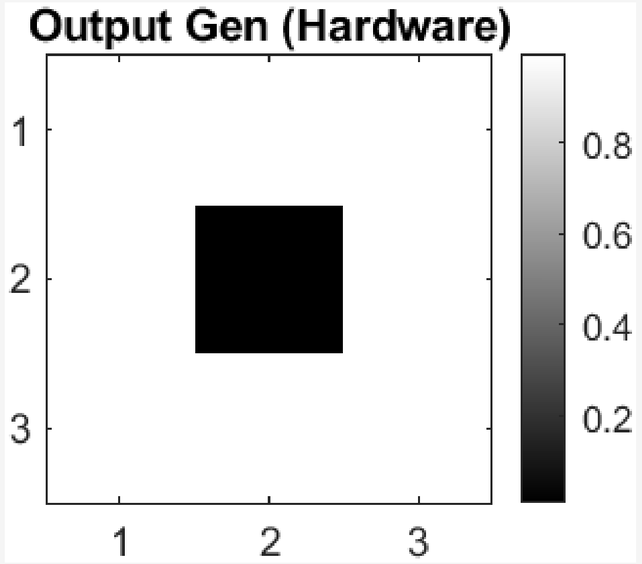
Data Keluaran Discriminator	Input
0.467146543573427	[0,1] cross
0.46739828818349	[1,0] cross

GANbatte

SIMULASI TEST VECTOR PADA SOFTWARE

Data Keluaran Generator	Input
0.97689122	[0,1] circle
0.977819264	
0.976722598	
0.97814095	
-0.978462934	
0.978764713	
0.978147566	
0.979395568	
0.978175342	

Data Keluaran Generator	Input
0.9766922	[1,0] circle
0.977481425	
0.976555347	
0.978261173	
-0.978381813	
0.97895503	
0.977772295	
0.979695916	
0.978521883	



Data Keluaran Discriminator	Input
0.470870368086946	[0,1] circle
0.470775017264912	[1,0] circle

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ARSITEKTUR GAN

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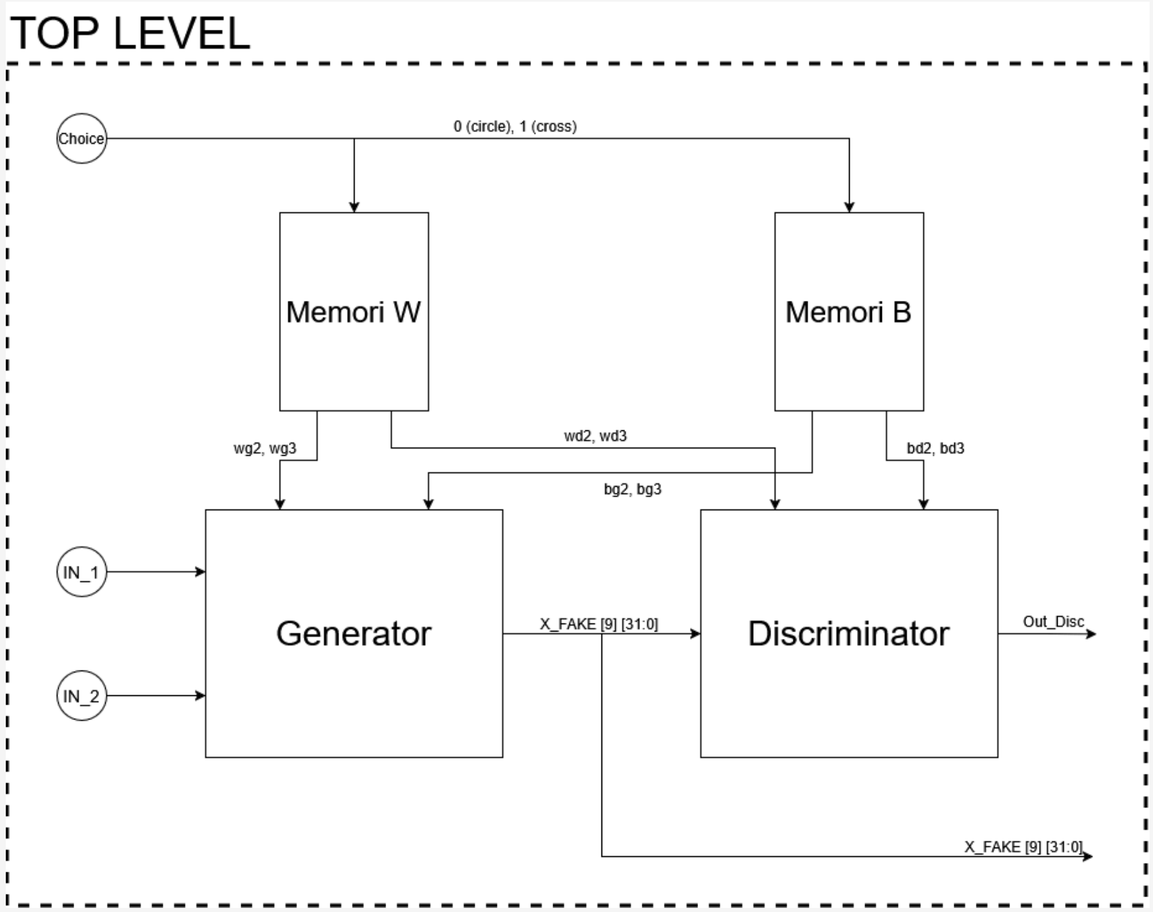
ARSITEKTUR GAN

Desain
Top Level



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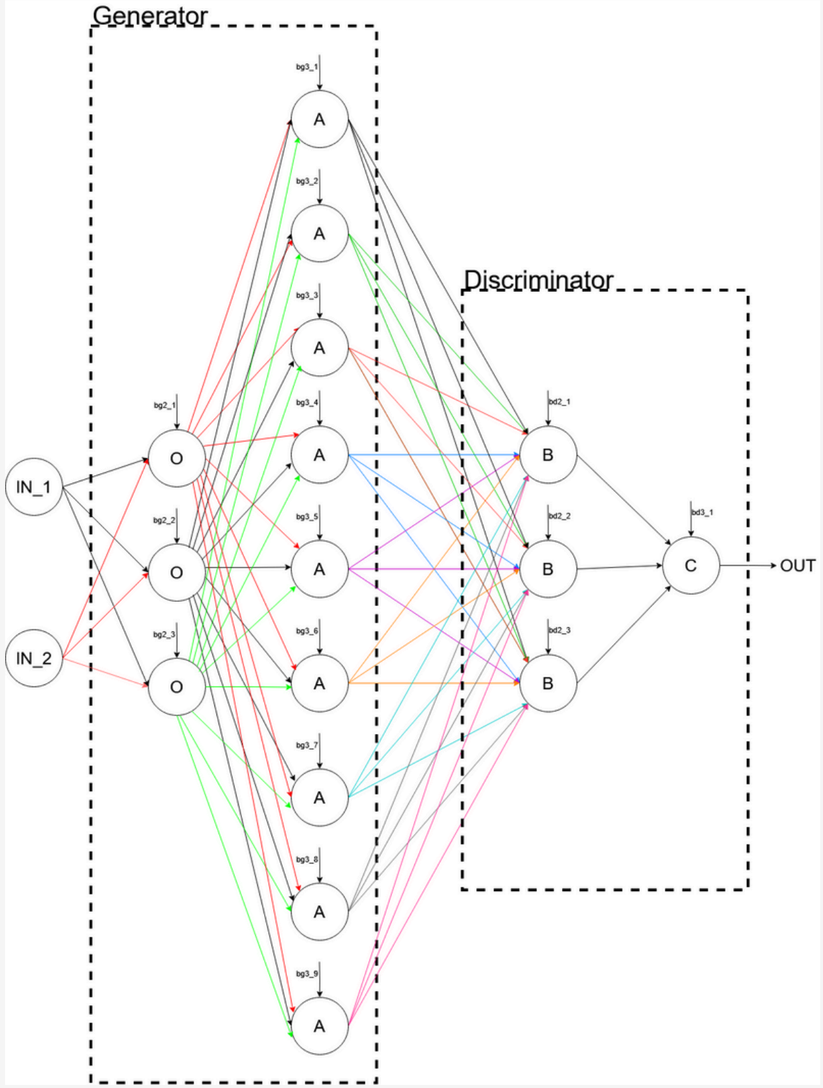
ARSITEKTUR GAN

Desain
Generator dan
Diskriminator



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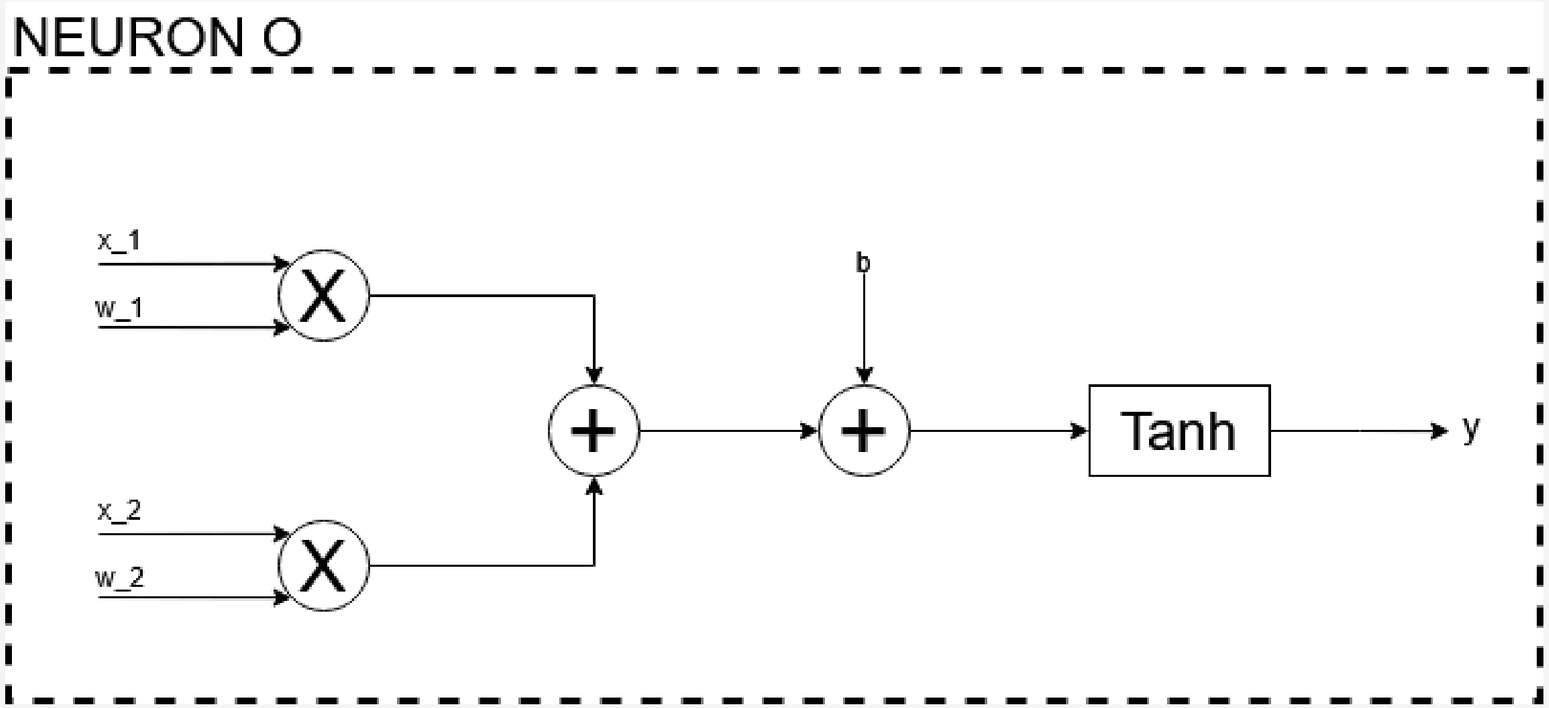
ARSITEKTUR GAN

Desain
Neuron O



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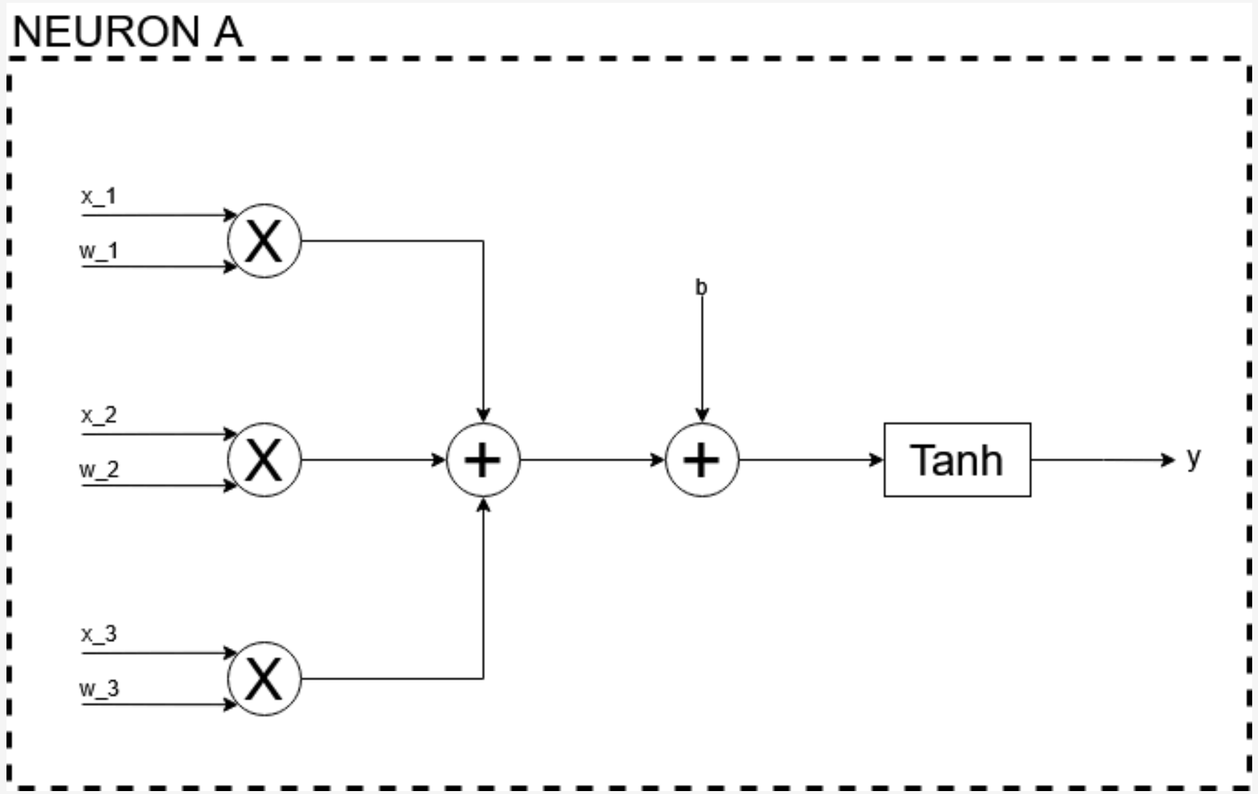
ARSITEKTUR GAN

Desain
Neuron A



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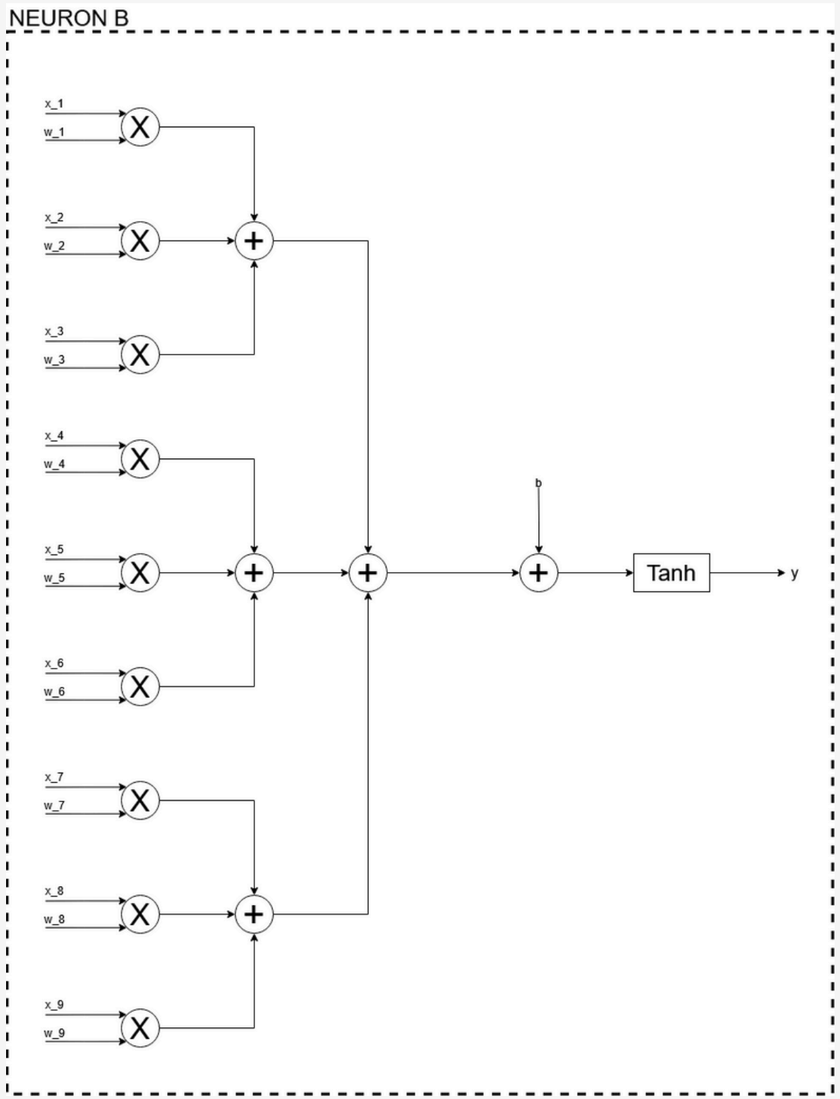
ARSITEKTUR GAN

Desain
Neuron B



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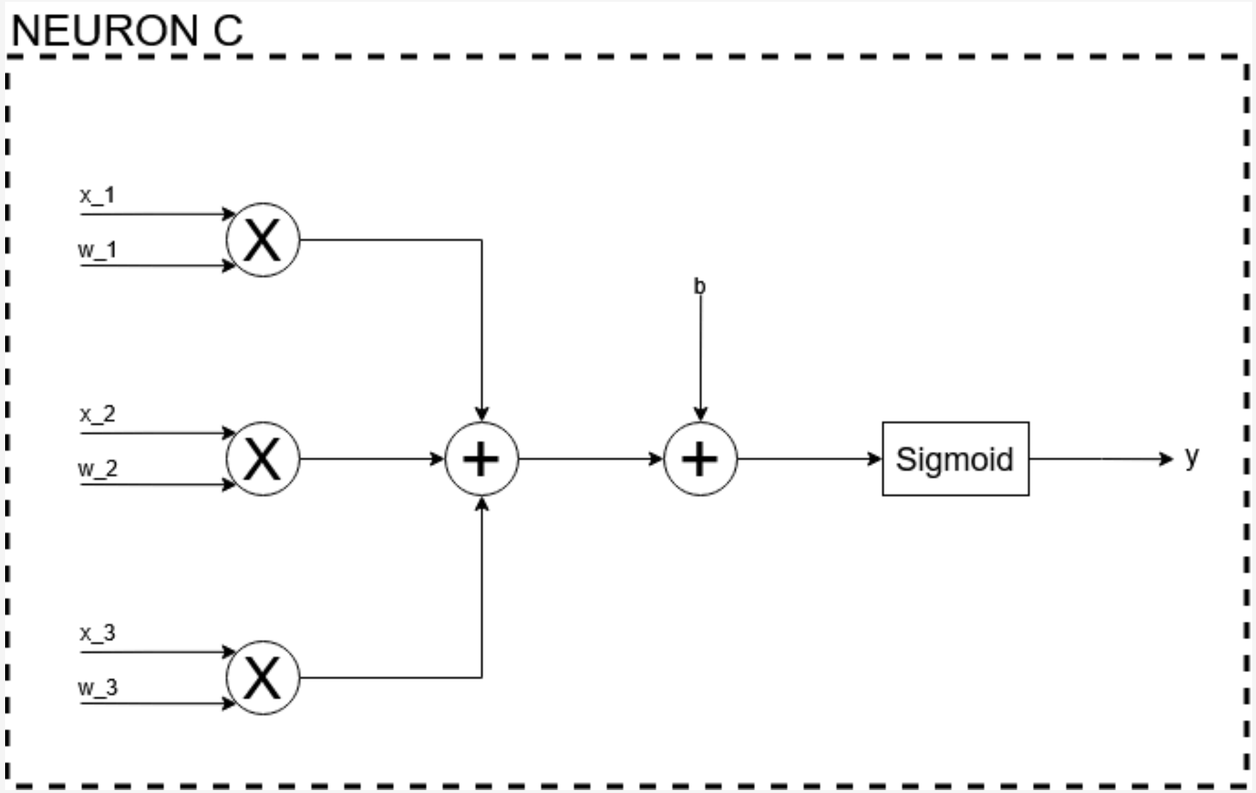
ARSITEKTUR GAN

Desain
Neuron C



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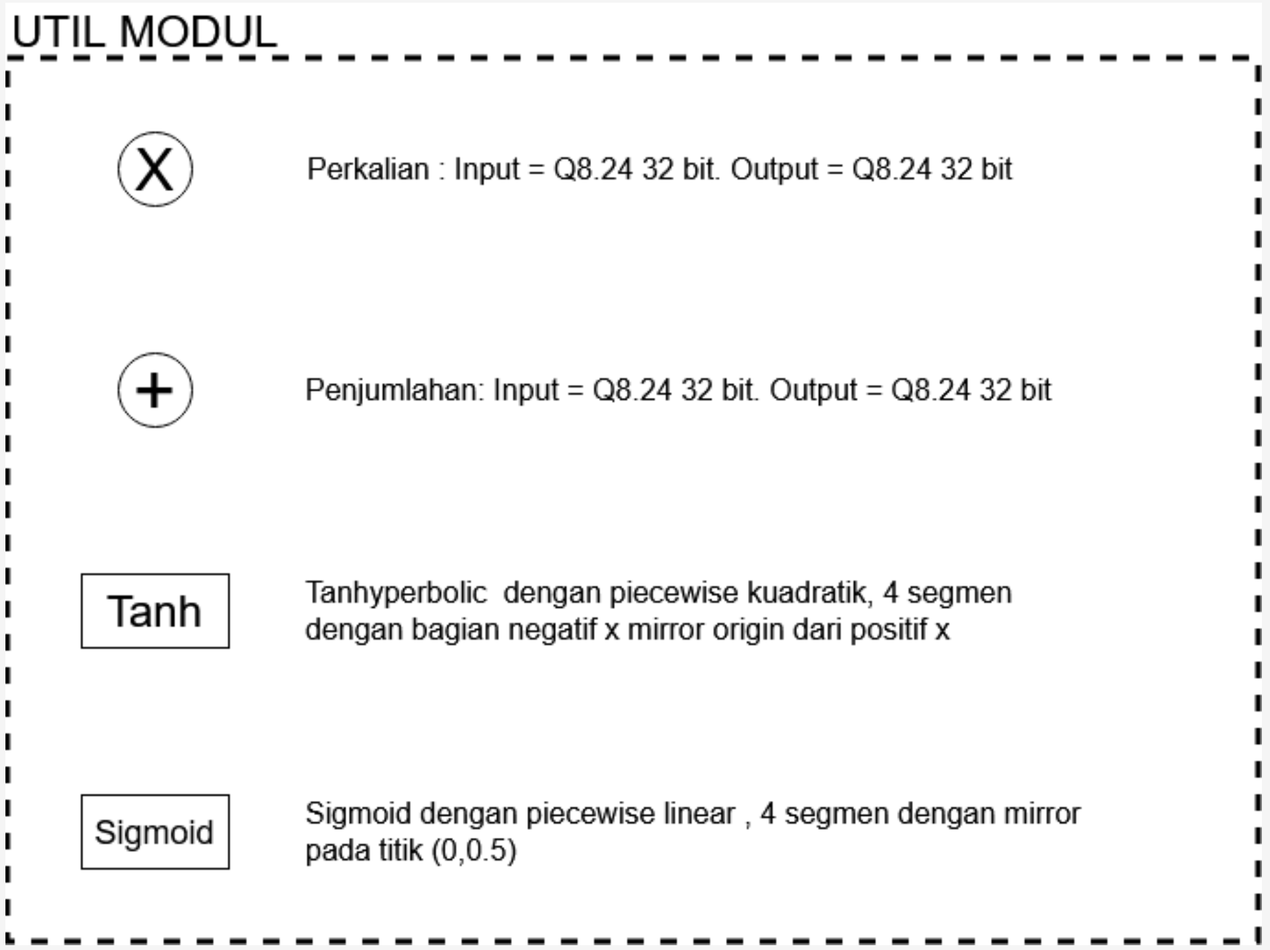
ARSITEKTUR GAN

Legend



TESTBENCH

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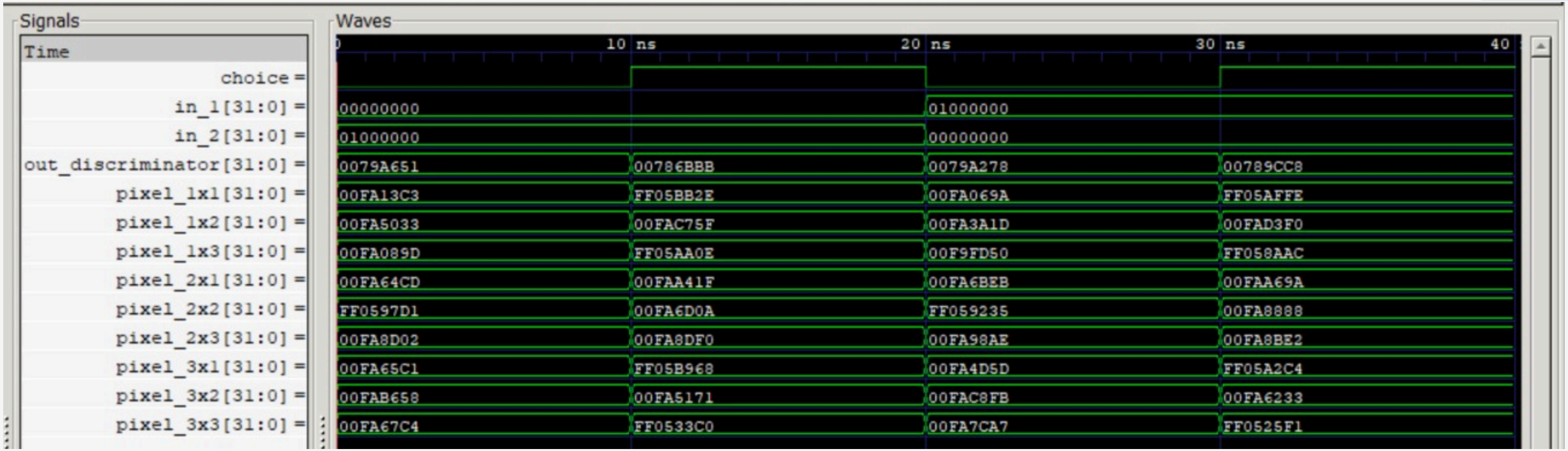

TESTBENCH CROSS

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Perbandingan data (xfake keluaran generator)			
Error (%)	Hardware	Software	Input
0.020477121	-0.977612615	-0.977812843	
0.028899382	0.979604661	0.979887843	
0.011996887	-0.977873921	-0.97799125	
0.023546588	0.979066789	0.97929738	
0.026756421	0.978226304	0.978488112	
0.020594499	0.978728294	0.9789299	
0.022429414	-0.977639675	-0.977859003	
0.022502788	0.977805197	0.97802528	
0.01209354	-0.979679108	-0.9797976	[0,1] cross
0.005369849	-0.977783322	-0.977835831	
0.012659491	0.97979641	0.979920463	
3.858E-05	-0.978352785	-0.978353163	
0.004840209	0.979104638	0.979152031	
0.006650272	0.978645802	0.978710888	
0.004398076	0.978696942	0.978739988	
0.00393016	-0.977985144	-0.978023582	
0.005777117	0.978060901	0.978117408	
0.000379406	-0.97988981	-0.979886092	[1,0] cross

Perbandingan data (keluaran discriminator)			
Error(%)	Hardware	Software	Input
0.695133673	0.470393836	0.467146544	[0,1] cross
0.801030713	0.471142292	0.467398288	[1,0] cross

TESTBENCH CIRCLE

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0.002782267	0.97686404	0.97689122	
0.003377002	0.977786243	0.977819264	
0.00293531	0.976693928	0.976722598	
0.004125412	0.978100598	0.97814095	
0.031755829	-0.978152215	-0.978462934	
0.005170226	0.978714108	0.978764713	
0.003314932	0.978115141	0.978147566	
0.005227754	0.979344368	0.979395568	
0.119510874	0.979344368	0.978175342	[0,1] circle
0.003020839	0.976662695	0.9766922	
0.0032928	0.977449238	0.977481425	
0.003466822	0.976521492	0.976555347	
0.005313024	0.978209198	0.978261173	
0.014718673	-0.978237808	-0.978381813	
0.006417383	0.978892207	0.97895503	
0.002999214	0.97774297	0.977772295	
0.00680799	0.979629219	0.979695916	
0.005859825	0.978464544	0.978521883	[1,0] circle

0.918229128	0.475194037	0.470870368	[0,1] circle
0.926198069	0.475135326	0.470775017	[1,0] circle