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#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
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"""
import numpy as np
import matplotlib.pyplot as plt

# frequency is the number of times a wave repeats a second
# Adding noise using target SNR
t = np.linspace(1, 100, 1000)
originalSignal = 10*np.sin(t/(2*np.pi))
x_watts = originalSignal ** 2

# Set a target SNR
target_snr_db = 20

# Calculate signal power and convert to dB
sig_avg_watts = np.mean(x_watts)
sig_avg_db = 10 * np.log10(sig_avg_watts)

# Calculate noise according to [2] then convert to watts
noise_avg_db = sig_avg_db - target_snr_db
noise_avg_watts = 10 ** (noise_avg_db / 10)

# Generate an sample of white noise
mean_noise = 0
noise_volts = np.random.normal(mean_noise, np.sqrt(noise_avg_watts),
 len(x_watts))

# Noise up the original signal
copyOne = originalSignal + noise_volts
copyTwo = copyOne + noise_volts
copyThree = copyTwo + noise_volts

fig = plt.figure(figsize=(10,16))
ax = fig.add_subplot(111)
ax2 = fig.add_subplot(411)
ax3 = fig.add_subplot(412)
ax4 = fig.add_subplot(413)
ax5 = fig.add_subplot(414)

# make common x and y labels
ax.spines['top'].set_color('none')
ax.spines['bottom'].set_color('none')
ax.spines['left'].set_color('none')
ax.spines['right'].set_color('none')
ax.tick_params(labelcolor='w', top=False, bottom=False, left=False,
 right=False)
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ax.set_ylabel('Voltage (V)')
ax.set_xlabel('time')

# Plot original signal
ax2.title.set_text('Original Signal')
ax2.plot(t, originalSignal)

# Plot signal with noise
ax3.title.set_text('1st. analog copy of signal')
ax3.plot(t, copyOne)

# Plot signal with noise and added noise
ax4.title.set_text('2nd. analog copy of signal')
ax4.plot(t, copyTwo)

# Plot signal with noise and added noise * 2
ax5.title.set_text('3rd. analog copy of signal')
ax5.plot(t, copyThree)

plt.show()
```