In [ ]:
```
#пропишем логику телеграм-бота
import telebot
bot = telebot.TeleBot("1131908998:AAHxjEOAmz5vP7ofX9Vaudkyh1lJgHh6anY")
from telebot import types
import os
import random

@bot.message_handler(commands=['start'])
def send_hellow(message):
    bot.send_message(message.chat.id, "Send me your image!")

@bot.message_handler(commands=['help'])
def send_hellow(message):
    bot.send_message(message.chat.id, "Hellow, it's style-tranfering Bot. Here

@bot.message_handler(content_types=['text'])
def get_text_messages(message):
    bot.send_message(message.from_user.id, "Type /help to get information about



@bot.message_handler(content_types=['photo'])
def photo(message):

      #клавиатура для выбора стиля художников
      keyboard = types.InlineKeyboardMarkup()

      key_kand = types.InlineKeyboardButton(text='Kandinsky', callback_data='Ka
      keyboard.add(key_kand)

      key_lampas = types.InlineKeyboardButton(text='Lampas', callback_data='Lam
      keyboard.add(key_lampas)

      key_monet = types.InlineKeyboardButton(text='Monet', callback_data='Monet
      keyboard.add(key_monet)

      key_malevich = types.InlineKeyboardButton(text='Malevich', callback_data=
      keyboard.add(key_malevich)

      key_lozhkin = types.InlineKeyboardButton(text='Lozhkin', callback_data='L
      keyboard.add(key_lozhkin)

      key_gogh = types.InlineKeyboardButton(text='Gogh', callback_data='Gogh')
      keyboard.add(key_gogh)

      bot.send_message(message.from_user.id, text="Choose what artist's style y


      #ловим фото пользователя, сохраняем
      fileID = message.photo[-1].file_id
      file_info = bot.get_file(fileID)
      downloaded_file = bot.download_file(file_info.file_path)
      #bot.send_photo(message.from_user.id, downloaded_file)
      with open("/content/drive/My Drive/bot_project/user_image.jpg", 'wb') as
         new_file.write(downloaded_file)



#хэндлер для нажатия клавиш
@bot.callback_query_handler(func=lambda call: True)
def callback_worker(call):
    #кидаем контентное фото пользователя в сеть, для стиля извлекаем фото в сос
    content_img = image_loader("/content/drive/My Drive/bot_project/user_image.
    input_img = content_img.clone()
    bot.send_message(call.from_user.id, "Wait about 40-60 seconds and you will 
    style_img = image_loader("/content/drive/My Drive/bot_project/{}.jpg".forma

    output = run_style_transfer(cnn, cnn_normalization_mean, cnn_normalization_
                                style_img,content_img, input_img)
    result_img=unloader(output.squeeze().cpu())

    if bool(os.listdir('/content/drive/My Drive/bot_project/{}/'.format(call.da
        img_number=max(list(map(lambda x: int(x.replace('.jpg','')),os.listdir(
    else:
        img_number=1

    result_img.save("/content/drive/My Drive/bot_project/{}/".format(call.data)
    bot.send_photo(call.message.chat.id, photo =open("/content/drive/My Drive/b
    bot.send_message(call.message.chat.id, text="Type /HiBot to send me another

bot.polling(none_stop=True, interval=0)
```

In [ ]:

```
%matplotlib inline
from PIL import Image


import torch
import torch.nn as nn
import torch.nn.functional as F
import torch.optim as optim

import matplotlib.pyplot as plt


import torchvision.transforms as transforms
import torchvision.models as models

import copy
```

## Пропишем style-transfer net

In [ ]:

```
imsize = 512

loader = transforms.Compose([
    transforms.Resize(imsize),
    transforms.CenterCrop(imsize),
    transforms.ToTensor()])
```

In [ ]:

```
device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
def image_loader(image_name):
    image = Image.open(image_name)
    image = loader(image).unsqueeze(0)
    return image.to(device, torch.float)
```

In [ ]:
```
unloader = transforms.ToPILImage()
plt.ion()
def imshow(tensor, title=None):
    image = tensor.cpu().clone()
    image = image.squeeze(0)
    image = unloader(image)
    plt.imshow(image)
    if title is not None:
        plt.title(title)
    plt.pause(0.001)
```

In [ ]:
```
class ContentLoss(nn.Module):

        def __init__(self, target):
            super(ContentLoss, self).__init__()
            self.target = target.detach()
            self.loss = F.mse_loss(self.target, self.target )
        def forward(self, input):
            self.loss = F.mse_loss(input, self.target)
            return input
def gram_matrix(input):
        batch_size , h, w, f_map_num = input.size()
        features = input.view(batch_size * h, w * f_map_num)
        G = torch.mm(features, features.t())
        return G.div(batch_size * h * w * f_map_num)
class StyleLoss(nn.Module):
        def __init__(self, target_feature):
            super(StyleLoss, self).__init__()
            self.target = gram_matrix(target_feature).detach()
            self.loss = F.mse_loss(self.target, self.target)

        def forward(self, input,alpha=0.5):
            G = gram_matrix(input)
            self.loss = F.mse_loss(G, self.target)
            return input
cnn_normalization_mean = torch.tensor([0.485, 0.456, 0.406]).to(device)
cnn_normalization_std = torch.tensor([0.229, 0.224, 0.225]).to(device)
class Normalization(nn.Module):
        def __init__(self, mean, std):
            super(Normalization, self).__init__()
            self.mean = torch.tensor(mean).view(-1, 1, 1)
            self.std = torch.tensor(std).view(-1, 1, 1)

        def forward(self, img):
            return (img - self.mean) / self.std
content_layers_default = ['conv_4']
style_layers_default = ['conv_1', 'conv_2', 'conv_3', 'conv_4', 'conv_5']
cnn = models.vgg19(pretrained=True).features.to(device).eval()
```

In [ ]:
```
def get_style_model_and_losses(cnn, normalization_mean, normalization_std,
                                   style_img,content_img,
                                   content_layers=content_layers_default,
                                   style_layers=style_layers_default):
        cnn = copy.deepcopy(cnn)

        normalization = Normalization(normalization_mean, normalization_std).to

        content_losses = []
        style_losses = []

        model = nn.Sequential(normalization)

        i = 0
        for layer in cnn.children():
            if isinstance(layer, nn.Conv2d):
                i += 1
                name = 'conv_{}'.format(i)
            elif isinstance(layer, nn.ReLU):
                name = 'relu_{}'.format(i)
                layer = nn.ReLU(inplace=False)
            elif isinstance(layer, nn.MaxPool2d):
                name = 'pool_{}'.format(i)
            elif isinstance(layer, nn.BatchNorm2d):
                name = 'bn_{}'.format(i)
            else:
                raise RuntimeError('Unrecognized layer: {}'.format(layer.__clas

            model.add_module(name, layer)

            if name in content_layers:
                target = model(content_img).detach()
                content_loss = ContentLoss(target)
                model.add_module("content_loss_{}".format(i), content_loss)
                content_losses.append(content_loss)

            if name in style_layers:
                target_feature = model(style_img).detach()
                style_loss = StyleLoss(target_feature)
                model.add_module("style_loss_{}".format(i), style_loss)
                style_losses.append(style_loss)

        for i in range(len(model) - 1, -1, -1):
            if isinstance(model[i], ContentLoss) or isinstance(model[i], StyleL
                break

        model = model[:(i + 1)]

        return model, style_losses, content_losses
```

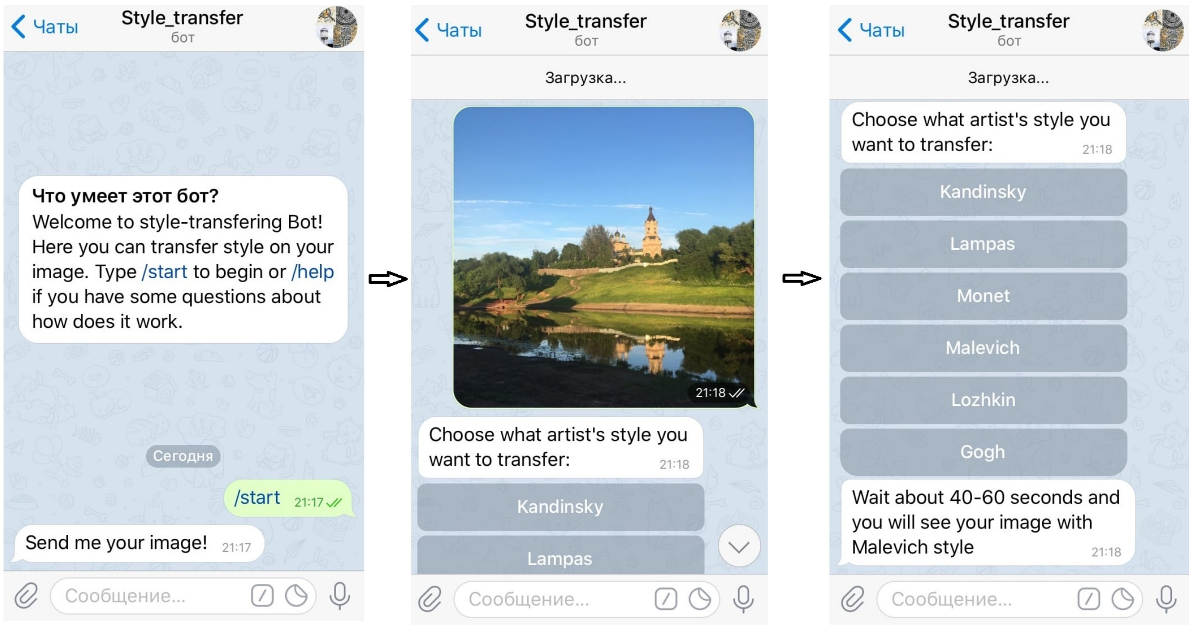
In [ ]:
```
def get_input_optimizer(input_img):
        optimizer = optim.LBFGS([input_img.requires_grad_()])
        return optimizer
```

In [ ]:
```
def run_style_transfer(cnn, normalization_mean, normalization_std,
                         style_img, content_img, input_img, num_steps=400,
                        style_weight=100000, content_weight=1):
    model, style_losses, content_losses = get_style_model_and_losses(cnn,
        normalization_mean, normalization_std, style_img, content_img)
    optimizer = get_input_optimizer(input_img)

    run = [0]
    while run[0] <= num_steps:

        def closure():
            input_img.data.clamp_(0, 1)

            optimizer.zero_grad()

            model(input_img)

            style_score = 0
            content_score = 0

            for sl in style_losses:
                style_score += sl.loss
            for cl in content_losses:
                content_score += cl.loss

            style_score *= style_weight
            content_score *= content_weight

            loss = style_score + content_score
            loss.backward()

            return style_score + content_score

        optimizer.step(closure)

    input_img.data.clamp_(0, 1)

    return input_img
```

## Демонстрация работы

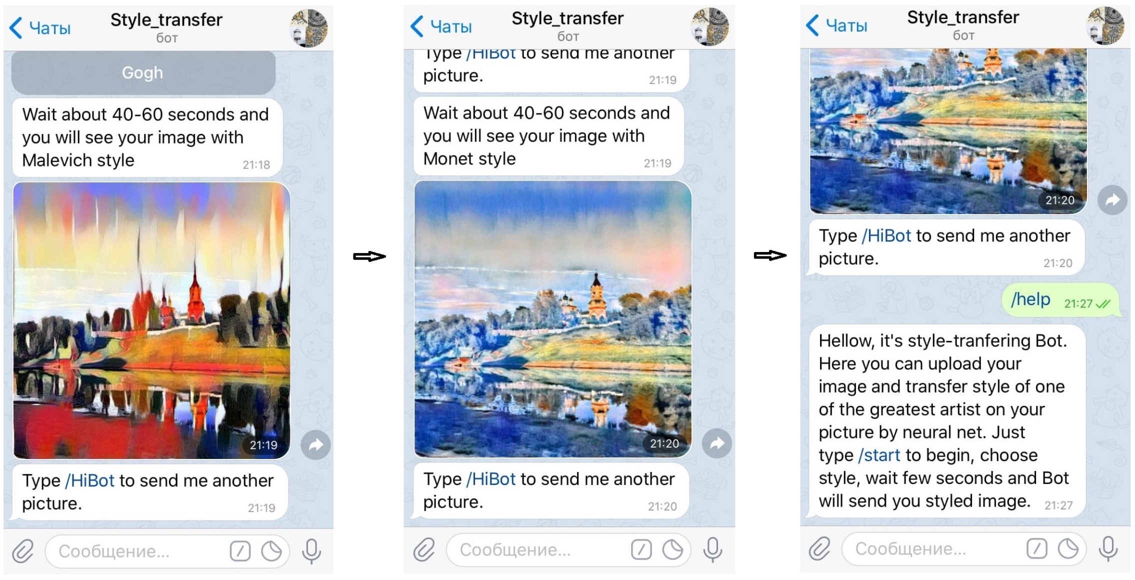
In [16]:
```
from IPython.display import Image
Image(filename='C:\\Users\\Дарья\\Desktop\\11.jpg',width=800, height=400)
```

Out[16]:


Чаты
Style_transfer
бот
Что умеет этот бот?
Welcome to style-transfering Bot! Here you can transfer style on your image. Type /start to begin or /help if you have some questions about how does it work.
Сегодня
/start 21:17
Send me your image! 21:17
Сообщение...
Загрузка...
21:18
Choose what artist's style you want to transfer: 21:18
Kandinsky
Lampas
Monet
Malevich
Lozhkin
Gogh
Wait about 40-60 seconds and you will see your image with Malevich style 21:18

In [14]:
```
from IPython.display import Image
Image(filename='C:\\Users\\Дарья\\Desktop\\12.jpg',width=800, height=400)
```

Out[14]:



Wait about 40-60 seconds and you will see your image with Malevich style 21:18

21:19

Type /HiBot to send me another picture. 21:19

Type /HiBot to send me another picture. 21:19

Wait about 40-60 seconds and you will see your image with Monet style 21:19

21:20

Type /HiBot to send me another picture. 21:20

21:20

Type /HiBot to send me another picture. 21:20

/help 21:27

Hellow, it's style-tranfering Bot. Here you can upload your image and transfer style of one of the greatest artist on your picture by neural net. Just type /start to begin, choose style, wait few seconds and Bot will send you styled image. 21:27