

Supplementary Material for “Organ-Aware Routing Mixture-of-Retrieval Augmented Generation for Fetal Ultrasound Reporting”

Appendix

A Examples of Report Generation

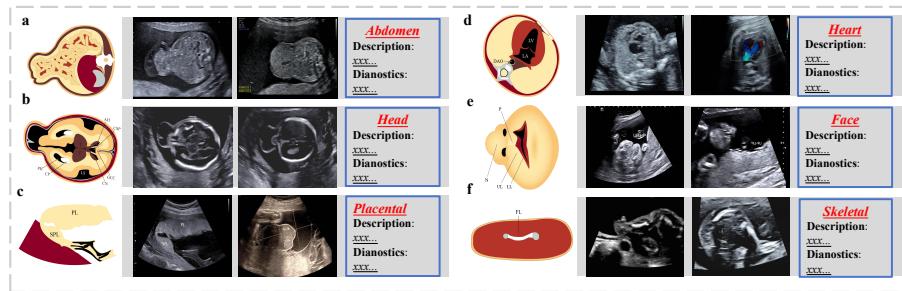


Figure A1: Example of 6 types of diseases detected by prenatal ultrasound.

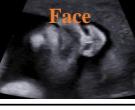
Ultrasound Image	BiomedCLIP	Ours	G T
	<p>Fetal head: The skull appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The brain is well visualized. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious abnormalities in the morphology of the cerebellar hemisphere, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>	<p>Fetal head: The skull appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The brain is well visualized. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious abnormalities in the morphology of the cerebellar hemisphere, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>	<p>Fetal head: The skull appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The brain is well visualized. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious abnormalities in the morphology of the cerebellar hemisphere, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>
	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be defined. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>
	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The left and right atria, as well as the left and right ventricles, are generally symmetrical in size and shape. The four chamber view shows the left and right ventricles. There is a cross shaped cross in the center of the heart, with clear left and right atrioventricular valves and visible openings of the superior and inferior vena cava. The mitral valve can be seen at the anteroseptal groove, and the dilated coronary sinus merges into the right atrium. Left and right coronary artery can be displayed, arranged in a clockwise manner in the heart, with no significant abnormalities and no adhesion. The coronary sinus is visible and no adhesion is present. Three vessel tracheal section: A longitudinal section of a blood vessel, with the probe rotated 90°, the left superior vena cava, a slightly tilted probe towards the head can reveal the left innominate vein. By rotating the probe 90°, the longitudinal section of the right superior vena cava can be displayed. In the same direction of the modified vessel, it can be seen that it merges into the dilated coronary sinus. The right superior vena cava can be displayed, arranged in a clockwise manner in the heart, with no significant abnormalities. There is no obvious regurgitation in the left and right atrioventricular valves, no shunt at the ventricular level, and the blood flow in the coronary sinus is normal. Four vessel tracheal section is congenital. The blood flow in the left superior vena cava merges into the right atrium through the dilated coronary sinus, and the blood flow in the right superior vena cava merges into the left atrium. Fetal lungs: Both lungs are visible, with uniform echoes.</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chamber view can clearly show that the left and right atria, as well as the left and right ventricles, are generally symmetrical in size and shape. The four chamber view shows the left and right ventricles. There is a cross shaped cross in the center of the heart, with clear left and right atrioventricular valves and visible openings of the superior and inferior vena cava. The mitral valve can be seen at the anteroseptal groove, and the dilated coronary sinus merges into the right atrium. Left and right coronary artery can be displayed, arranged in a clockwise manner in the heart, with no significant abnormalities and no adhesion. The coronary sinus is visible and no adhesion is present. Three vessel tracheal section: A longitudinal section of a blood vessel, with the probe rotated 90°, the left superior vena cava, a slightly tilted probe towards the head can reveal the left innominate vein. By rotating the probe 90°, the longitudinal section of the right superior vena cava can be displayed. In the same direction of the modified vessel, it can be seen that it merges into the dilated coronary sinus. The right superior vena cava can be displayed, arranged in a clockwise manner in the heart, with no significant abnormalities. There is no obvious regurgitation in the left and right atrioventricular valves, no shunt at the ventricular level, and the blood flow in the coronary sinus is normal. Four vessel tracheal section is congenital. The blood flow in the left superior vena cava merges into the right atrium through the dilated coronary sinus, and the blood flow in the right superior vena cava merges into the left atrium. Fetal lungs: Both lungs are visible, with uniform echoes.</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chamber view can clearly show that the left and right atria, as well as the left and right ventricles, are generally symmetrical in size and shape. The four chamber view shows the left and right ventricles. There is a cross shaped cross in the center of the heart, with clear left and right atrioventricular valves and visible openings of the superior and inferior vena cava. The mitral valve can be seen at the anteroseptal groove, and the dilated coronary sinus merges into the right atrium. Left and right coronary artery can be displayed, arranged in a clockwise manner in the heart, with no significant abnormalities and no adhesion. The coronary sinus is visible and no adhesion is present. Three vessel tracheal section: A longitudinal section of a blood vessel, with the probe rotated 90°, the left superior vena cava, a slightly tilted probe towards the head can reveal the left innominate vein. By rotating the probe 90°, the longitudinal section of the right superior vena cava can be displayed. In the same direction of the modified vessel, it can be seen that it merges into the dilated coronary sinus. The right superior vena cava can be displayed, arranged in a clockwise manner in the heart, with no significant abnormalities. There is no obvious regurgitation in the left and right atrioventricular valves, no shunt at the ventricular level, and the blood flow in the coronary sinus is normal. Four vessel tracheal section is congenital. The blood flow in the left superior vena cava merges into the right atrium through the dilated coronary sinus, and the blood flow in the right superior vena cava merges into the left atrium. Fetal lungs: Both lungs are visible, with uniform echoes.</p>
	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no obvious protrusion or depression in the abdominal wall. Fetal liver, gallbladder, stomach, and intestines are visible in the liver, gallbladder, stomach, and intestines.</p>	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no obvious protrusion or depression in the abdominal wall. Fetal liver, gallbladder, stomach, and intestines are visible in the liver, gallbladder, stomach, and intestines.</p>	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no obvious protrusion or depression in the abdominal wall. Fetal liver, gallbladder, stomach, and intestines are visible in the liver, gallbladder, stomach, and intestines.</p>
	<p>Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and hands; hands in a fist shape. Visible on both thighs and ankles visible on both calves and fibulae, visible on ankles.</p>	<p>Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and hands; hands in a fist shape. Bilateral thighs and their femurs are visible, bilateral calves and their fibulae are visible, bilateral ankles, both calves and soles are visible on all surfaces, both feet are in an inverted position, and this position remains unchanged when the limbs move 2-3 times.</p>	<p>Fetal limbs: Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and hands in a fist shape. Bilateral thighs and their femurs are visible, bilateral calves and their fibulae are visible, bilateral ankles, both feet are visible, both calves and soles are visible on all surfaces, both feet are in an inverted position, and this position remains unchanged when the limbs move 2-3 times.</p>
	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the posterior wall of the uterus and is of grade 0.</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade 0.</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the posterior wall of the uterus and is of grade 0.</p>
	<p>Examination prompt: Intermittent pregnancy, single live birth, breech presentation, placenta grade 0. The size of the fetus is equivalent to 25 weeks and 1 day. The heart of the fetus shows changes in both feet, indicating inversion of both feet. Suggest visiting a prenatal diagnosis clinic. Abnormal limbs.</p>	<p>Examination prompt: Intermittent pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 24 weeks and 6 days. The ultrasound of the fetus shows changes in both feet, indicating inversion of both feet. Suggest visiting a prenatal diagnosis clinic. Abnormal limbs.</p>	<p>Examination prompt: Intermittent pregnancy, single live birth, breech presentation, placenta grade 0. The size of the fetus is equivalent to 24 weeks and 6 days. The ultrasound of the fetus shows changes in both feet, indicating inversion of both feet. Suggest visiting a prenatal diagnosis clinic. Abnormal limbs.</p>

Figure A2: Example of limbs abnormality of report generation.

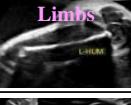
Ultrasound Image	BiomedCLIP	Ours	G T
	<p>Fetal head: The skull presents an elliptical hyperechoic ring, with symmetrical cerebellar hemispheres on both sides, the midline of the brain connect, and no significant expansion of the lateral ventricles. The transparent compartment is visible. The brainstem is visible and symmetrical. On the transverse section of the brain, there are no obvious abnormalities in the morphology of the cerebellar hemisphere. There is no significant enlargement of the posterior cranial fossa. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>	<p>Fetal head: The skull presents an elliptical hyperechoic ring, with symmetrical cerebellar hemispheres on both sides, the midline of the brain connect, and no significant expansion of the lateral ventricles. The transparent compartment is visible. The brainstem is visible and symmetrical. On the transverse section of the brain, there are no obvious abnormalities in the morphology of the cerebellar hemisphere. There is no significant enlargement of the posterior cranial fossa. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>	<p>Fetal head: The skull presents an elliptical hyperechoic ring, with symmetrical cerebellar hemispheres on both sides, the midline of the brain connect, and no significant expansion of the lateral ventricles. The transparent compartment is visible. The brainstem is visible and symmetrical. On the transverse section of the brain, there are no obvious abnormalities in the morphology of the cerebellar hemisphere, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>
	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>
	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the projection of the heart. The four chambers of the heart can clearly show that the left and right atria, as well as the left and right ventricles, are basically symmetrical in size. The oval valve is clear and open, and the atrioventricular valves are visible. The atrioventricular valves are clear, and opening and closing movements can be seen in the movement of the left and right ventricular walls. The sectional view of the left and right ventricular outflow tract is clear, and the connection between the ventricle and the atria exists in the center of the heart. The left and right atrioventricular valves are clear, and opening and closing movements can be seen in the movement of the left and right ventricular walls. The two are arranged in a cross pattern in the heart, and there is no obvious abnormality in the diameter of the tube. Fetal lungs: Both lungs are visible, with uniform echoes.</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the projection of the heart. The four chambers of the heart can clearly show that the left and right atria, as well as the left and right ventricles, are basically symmetrical in size. The oval valve is clear and open, and the atrioventricular valves are visible. The atrioventricular valves are clear, and opening and closing movements can be seen in the movement of the left and right ventricular walls. The sectional view of the left and right ventricular outflow tract is clear, and the connection between the ventricle and the atria exists in the center of the heart. The left and right atrioventricular valves are clear, and opening and closing movements can be seen in the movement of the left and right ventricular walls. The two are arranged in a cross pattern in the heart, and there is no significant abnormality in the diameter of the tube. X</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the projection of the heart. The four chambers of the heart can clearly show that the left and right atria, as well as the left and right ventricles, are basically symmetrical in size. The oval valve is clear and open, and the atrioventricular valves are visible. The atrioventricular valves are clear, and opening and closing movements can be seen in the movement of the left and right ventricular walls. The sectional view of the left and right ventricular outflow tract is clear, and the connection between the ventricle and the atria exists in the center of the heart. The left and right atrioventricular valves are clear, and opening and closing movements can be seen in the movement of the left and right ventricular walls. The two are arranged in a cross pattern in the heart, and there is no significant abnormality in the diameter of the tube. X</p>
	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no obvious mass at the root of the umbilical cord. Fetal liver, gallbladder, stomach, and intestines are visible in the liver, gallbladder, stomach, and intestines.</p>	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no obvious mass at the root of the umbilical cord. Fetal liver, gallbladder, stomach, and intestines are visible in the liver, gallbladder, stomach, and intestines.</p>	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no obvious mass at the root of the umbilical cord. Fetal liver, gallbladder, stomach, and intestines are visible in the liver, gallbladder, stomach, and intestines.</p>
	<p>Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Visible on both thighs and femurs, visible on both calves and tibiae and fibulae, visible on both feet.</p>	<p>Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Visible on both thighs and femurs, visible on both calves and tibiae and fibulae, visible on both feet.</p>	<p>Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Visible on both thighs and femurs, visible on both calves and tibiae and fibulae, visible on both feet.</p>
	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the posterior wall of the uterus in a single layer. Grade I. The shape of the placenta is circular, and thick edges. It can be seen connecting the upper and lower edges to the uterus. The internal echoes are consistent with the echoes of the fetal tissue.</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade I.</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade I.</p>
	<p>Examination prompt: Intermittent pregnancy, singleton live birth, placenta grade I. The size of the fetus is equivalent to 30 weeks and 4 days. Changes in placental ultrasound suggest the possibility of a discordant placenta. Abnormal placenta.</p>	<p>Examination prompt: Intermittent pregnancy, singleton live birth, placenta grade I. The size of the fetus is equivalent to 30 weeks and 4 days. Changes in placental ultrasound suggest the possibility of a discordant placenta. Abnormal placenta.</p>	<p>Examination prompt: Examination indicates intermittent pregnancy, singleton live birth, and placental grade I. The size of the fetus is equivalent to 30 weeks and 3 days. The fetal cardiac ultrasound changes are consistent with persistent fetal circulation. The patient should be referred to the visiting the prenatal diagnosis clinic and undergoing follow-up examination. Cardiac abnormalities.</p>

Figure A3: Example of limbs abnormality of report generation.

Ultrasound Image	BiomedCLIP	Ours	G T
 Head	Fetal head: The skull appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the brain ventricles. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious continuous interruptions in the white matter tracts, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.	Fetal head: The skull appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the brain ventricles. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious continuous interruptions in the white matter tracts, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.	Fetal head: The skull appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the brain ventricles. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious continuous interruptions in the white matter tracts, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.
 Face	Fetal face: The fetal epiphysis can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.	Fetal face: The fetal epiphysis can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.	Fetal face: The fetal epiphysis can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.
 Heart	Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportionality of the left to the right atria. The ECG tracing can clearly show that the left atrium, as well as the left and right ventricles, are basically symmetrical in size. The oval valve of the mitral valve segment in the left atrium, and a closed tricuspid valve in the center of the heart. The left atrium and right atrium valves are clear, and opening and closing movements can be seen in the center of the heart. The left and right ventricular walls are clear, and opening and closing movements can be observed in the movement of the left and right ventricular walls. The sectional view of the left and right ventricular outflow tract shows the aorta and pulmonary artery after the bifurcation. The two are clearly cross pattern in the heart, and there is no obvious abnormality in the diameter of the tube. Fetal lungs: Both lungs are visible, with uniform echoes.	Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportionality of the left to the right atria. The ECG tracing can clearly show that the left atrium, as well as the left and right ventricles, are basically symmetrical in size. The oval valve of the mitral valve segment in the left atrium, and a closed tricuspid valve in the center of the heart. The left atrium and right atrium valves are clear, and opening and closing movements can be seen in the center of the heart. The left and right ventricular walls are clear, and opening and closing movements can be observed in the movement of the left and right ventricular walls. The sectional view of the left and right ventricular outflow tract shows the aorta and pulmonary artery after the bifurcation. The two are clearly cross pattern in the heart, and there is no obvious abnormality in the diameter of the tube. Fetal lungs: Both lungs are visible, with uniform echoes.	Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportionality of the left to the right atria. The ECG tracing can clearly show that the left atrium, as well as the left and right ventricles, are basically symmetrical in size. The oval valve of the mitral valve segment in the left atrium, and a closed tricuspid valve in the center of the heart. The left atrium and right atrium valves are clear, and opening and closing movements can be seen in the center of the heart. The left and right ventricular walls are clear, and opening and closing movements can be observed in the movement of the left and right ventricular walls. The sectional view of the left and right ventricular outflow tract shows the aorta and pulmonary artery after the bifurcation. The two are clearly cross pattern in the heart, and there is no obvious abnormality in the diameter of the tube. Fetal lungs: Both lungs are visible, with uniform echoes.
 Abdomen	Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the umbilical wall. There is no obvious mass at the echo of the umbilical cord. Fetal liver, gallbladder, stomach, and intestines: visible in the liver, gallbladder, stomach, and intestines.	Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the umbilical wall. There is no obvious mass at the echo of the umbilical cord. Fetal liver, gallbladder, stomach, and intestines: visible in the liver, gallbladder, stomach, and intestines.	Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the umbilical wall. There is no obvious mass at the echo of the umbilical cord. Fetal liver, gallbladder, stomach, and intestines: visible in the liver, gallbladder, stomach, and intestines.
 Limbs	Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Visible on both thighs and femur, visible on both calves and tibiae and fibula, visible on both feet.	Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Visible on both thighs and femur, visible on both calves and tibiae and fibula, visible on both feet.	Fetal limbs: Visible upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Visible on both thighs and femur, visible on both calves and tibiae and fibula, visible on both feet.
 Placenta	Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attached to the posterior wall of the uterus and is of grade 0. The size of the placenta is circular, and thick and strong colors can be seen connecting the upper and lower edges of the placenta. The internal echoes are consistent with the echoes of the placental tissue.	Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attached to the posterior wall of the uterus and is classified as grade 0. A solid dark area can be seen under the placental chorionic plate with a range of about $6.0 \times 1.3\text{cm}$, and dotted echo fluctuations can be seen inside.	Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attached to the anterior wall of the uterus and is of grade 0. A liquid dark area can be seen at the lower edge of the placenta, with a range of about $8.3 \times 1.8\text{cm}$.
 Diagnostic Results	Examination prompt: Intrauterine pregnancy, singleton live birth, placenta grade 0. The size of the fetus is equivalent to 24 weeks and 1 day. Changes in placental thickness, consider placental abruption, Abnormal placenta.	Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 24 weeks and 3 days. Changes in placental thickness, considering placental abruption, Abnormal placenta.	Examination prompt: Intrauterine pregnancy, singleton live birth, placenta grade 0. The size of the fetus is equivalent to 24 weeks and 4 days. Changes in placental thickness, possibly involving blood sinuses. Abnormal placenta.

Figure A4: Example of placenta abnormality of report generation.

Ultrasound Image	BiomedCLIP	Ours	G T
 Head	<p>Fetal brain: The fetal brain appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The transparent compartment is visible. The thalamus is visible and symmetrical on both sides.</p> <p>The thalamus is visible and symmetrical on both sides. There are no obvious abnormalities in the morphology of the cerebellar hemisphere, white matter, or ventricles on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>	<p>Fetal brain: The fetal brain appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The transparent compartment is visible. The thalamus is visible and symmetrical on both sides. There are no obvious abnormalities in the morphology of the cerebellar hemisphere, white matter, or ventricles on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>	<p>Fetal brain: The fetal brain appears as an elliptical hyperechoic ring, with symmetrical cerebral hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The transparent compartment is visible. The thalamus is visible and symmetrical on both sides. On the thalamus we can see some heterogeneity. There are no obvious abnormalities in the morphology of the cerebellar hemisphere, white matter, or ventricles on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p>
 Face	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>
 Heart	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The left and right atria, as well as the left and right ventricles, are basically symmetrical in size, with consistent connections between the atria and ventricles. There is a cross-shaped cross in the center of the heart, and the four-chamber view can be clearly seen. Visible opening and closing movements of both sides of the coronary sinus can be seen in the atrioventricular junction. The left and right ventricular outflow tract sections. The left and pulmonary artery can be displayed, arranged in a clockwise direction in the four-chamber view. The connection between the ventricle and the aorta is consistent. Three vessels can be seen on the left side. A transverse section of a blood vessel can be seen on the right side. A longitudinal section of a blood vessel can be displayed towards the head. The blood flow in the left superior vena cava on the left side of the heart can be clearly seen. The blood flow in the left superior vena cava on the right side of the heart can be clearly seen. The blood flow in the left superior vena cava on the right side of the heart can be clearly seen. Can display a pulmonary vein entering the left atrium. Fetal lungs: Both lungs are visible, with uniform echoes.</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chamber view can be clearly seen. The left and right atria, as well as the left and right ventricles, are basically symmetrical in size. The oval valve of the interatrial septum is visible, and a cross shaped cross in the center of the heart. The left and right ventricular outflow tract sections. The left and pulmonary artery can be displayed, arranged in a clockwise direction in the four-chamber view. The connection between the ventricle and the aorta is consistent. Three vessels can be seen on the left side. A transverse section of a blood vessel can be seen on the right side. A longitudinal section of a blood vessel can be displayed towards the head. The blood flow in the left superior vena cava on the left side of the heart can be clearly seen. Both lungs are visible, with uniform echoes.</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chamber view can be clearly seen. The left and right atria, as well as the left and right ventricles, are basically symmetrical in size. The oval valve of the interatrial septum is visible, and a cross shaped cross in the center of the heart. The left and right ventricular outflow tract sections. The left and pulmonary artery can be displayed, arranged in a clockwise direction in the four-chamber view. The connection between the ventricle and the aorta is consistent. Three vessels can be seen on the left side. A transverse section of a blood vessel can be seen on the right side. A longitudinal section of a blood vessel can be displayed towards the head. The blood flow in the left superior vena cava on the left side of the heart can be clearly seen. Both lungs are visible, with uniform echoes.</p>
 Abdomen	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen originating from the fetal abdomen. There is no obvious mass on the root of the umbilical cord. Fetal liver: gallbladder, stomach, and intestines. Fetal liver: gallbladder, stomach, and intestines.</p>	<p>Fetal abdominal wall: The continuous echo of the fetal abdominal wall is interrupted, and the defect area is small. The abdominal wall is about 2.5mm. The umbilical cord originates from the fetal abdomen, and the umbilical cord is about 4.7cm long. There is no bulging mass. The umbilical artery is located on the surface of the fetus. The position of the umbilical abdominal wall insertion site is abnormal, located on the left side of the fetus.</p>	<p>Fetal abdominal wall: The continuous echo of the fetal abdominal wall is interrupted, and the defect area is small. The abdominal wall is about 2.5mm. The umbilical cord originates from the fetal abdomen, and the umbilical cord is about 4.7cm long. There is no bulging mass. The umbilical artery is located on the surface of the fetus. The position of the umbilical abdominal wall insertion site is abnormal, located on the left side of the fetus.</p>
 Limbs	<p>Fetal limbs: Visible upper arms and forearms on both sides, visible ulna and radius on both thighs and ankles, hands in a fist shape. Visible on both thighs and ankles, visible on both calves and tibiae and fibula, visible on feet.</p>	<p>Fetal limbs: Visible upper arms and forearms on both sides, visible ulna and radius on both thighs and ankles, hands in a fist shape. Visible on both thighs and ankles, visible on both calves and tibiae and fibula, visible on feet.</p>	<p>Fetal limbs: Visible upper arms and forearms on both sides, visible ulna and radius on both forearms and ankles, hands in a fist shape. Visible on both thighs and ankles, visible on both calves and tibiae and fibula, visible on feet.</p>
 Placenta	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade 0.</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade 0.</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade 0.</p>
 Diagnostic Results	<p>Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 25 weeks and 5 days. The systematic ultrasound changes are consistent with persistent left superior vena cava (bilateral superior vena cava). Cardiac anomalies.</p>	<p>Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 26 weeks and 5 days. Fetal cranial ultrasound changes indicate the absence of a trap body. Suggest visiting a prenatal diagnosis clinic for further diagnosis and undergoing MRI examination. Abnormal brain function.</p>	<p>Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 26 weeks and 5 days. Fetal cranial ultrasound changes indicate the absence of a trap body. Suggest visiting a prenatal diagnosis clinic for further diagnosis and undergoing MRI examination. Abnormal brain function.</p>

Figure A5: Example of abdomen abnormality of report generation.

Ultrasound Image	BiomedCLIP	Ours	G T
	<p>Fetal head: The skull presents an elliptical hyperchoic ring, with symmetrical cerebellar hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The third ventricle is visible. The thalamus is visible and symmetrical on both sides. On the transverse section of the cerebellum, there are no obvious abnormalities in the morphology of the cerebellum, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa.</p> <p style="text-align: center;">✖</p>	<p>Fetal head: The skull appears as an elliptical hyperchoic ring, with symmetrical cerebellar hemispheres on both sides, the midline of the brain centered, and no significant expansion of the lateral ventricles. The third ventricle is visible. The thalamus is visible, symmetrical on both sides, and the third ventricle is expanded. On the transverse section of the cerebellum, there are no obvious abnormalities in the morphology of the cerebellum, which is symmetrical on both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa. On the longitudinal section of the skull, the body complex appears, and the cingulate gyrus and the insular cortex appear. Color Doppler cannot display the posterior cranial fossa.</p> <p style="text-align: center;">✓</p>	<p>Fetal head: Fetal head. The skull presents an elliptical hyperchoic ring, with symmetrical hemispheres on both sides of the brain and a central midline. The lateral ventricles are dilated, and the third ventricle is enlarged. The cerebellum has an irregular appearance. The midline structures in the transverse section of the cerebellum are not clearly visible. On the transverse section of the cerebellum, there are no obvious abnormalities in the morphology of the cerebellum, which is symmetrical at both sides. The vermis of the cerebellum can be seen, and there is no significant enlargement of the posterior cranial fossa. On the longitudinal section of the skull, the body complex appears, and the cingulate gyrus and the insular cortex appear. Color Doppler cannot display the posterior cranial fossa.</p>
	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p> <p style="text-align: center;">✖</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>	<p>Fetal face: The fetal eyeballs can be displayed on both sides, symmetrically, and both nostrils can be displayed. There is no obvious continuous interruption in the echo of the upper lip skin.</p>
	<p>Fetal heart: Four chamber view: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chambers, atria, and ventricles, are generally symmetrical in size, with consistent connections between the atria and ventricles. There is a cross shaped cross in the atria. The atrioventricular valves and the right and left ventricles, are basically symmetrical in size. The oval valve of the interatrial septum is visible, and a cross shaped cross exists in the atria. The left and right atrioventricular valves are clear, and opening and closing movements can be seen on both sides of the valves. No significant abnormalities were observed in the atrioventricular valves or the ventricles. The sectional view of the left and right ventricular outflow tract is clear, and the aorta and pulmonary artery can be displayed. The aorta and pulmonary artery are in the same diameter, and there is no obvious abnormality in the diameter of the tube. Both lungs are visible, with uniform echoes.</p> <p style="text-align: center;">✖</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chamber view can clearly display the four chambers, atria, and ventricles. The left and right ventricles, are basically symmetrical in size. The oval valve of the interatrial septum is visible, and a cross shaped cross exists in the atria. The left and right atrioventricular valves are clear, and opening and closing movements can be seen on both sides of the valves. No significant abnormalities were observed in the atrioventricular valves or the ventricles. The sectional view of the left and right ventricular outflow tract is clear, and the aorta and pulmonary artery can be displayed. The aorta and pulmonary artery are in the same diameter, and there is no obvious abnormality in the diameter of the tube. Fetal lungs: Both lungs are visible, with uniform echoes.</p> <p style="text-align: center;">✓</p>	<p>Fetal heart: The apex of the heart points to the left side of the chest cavity, and there is no significant increase in the proportion of the heart to the chest. The four chamber view can clearly display the four chambers, atria, and ventricles. The left and right ventricles, are basically symmetrical in size. The oval valve of the interatrial septum is visible, and a cross shaped cross exists in the atria. The left and right atrioventricular valves are clear, and opening and closing movements can be seen on both sides of the valves. No significant abnormalities were observed in the atrioventricular valves or the ventricles. The sectional view of the left and right ventricular outflow tract is clear, and the aorta and pulmonary artery can be displayed. The aorta and pulmonary artery are in the same diameter, and there is no obvious abnormality in the diameter of the tube. Fetal lungs: Both lungs are visible, with uniform echoes.</p>
	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no insertion of the umbilical cord into the abdominal wall. Fetal liver, gallbladder, stomach, and intestines: Visible in the liver, gallbladder, stomach, and intestines.</p> <p style="text-align: center;">✖</p>	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no insertion of the umbilical cord into the abdominal wall. Fetal liver, gallbladder, stomach, and intestines: Visible in the liver, gallbladder, stomach, and intestines.</p>	<p>Fetal abdominal wall: There is no obvious continuity interruption in the echo of the abdominal wall, and the umbilical cord can be seen inserted into the fetal abdominal wall. There is no insertion of the umbilical cord into the abdominal wall. Fetal liver, gallbladder, stomach, and intestines: Visible in the liver, gallbladder, stomach, and intestines.</p>
	<p>Fetal limbs: Viable upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Viable on both thighs and femurs, visible on both calves and fibulae, visible on both feet.</p> <p style="text-align: center;">✖</p>	<p>Fetal limbs: Viable upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Viable on both thighs and femurs, visible on both calves and fibulae, visible on both feet.</p>	<p>Fetal limbs: Viable upper arms and humerus on both sides, visible ulna and radius on both forearms and inside, hands in a fist shape. Viable on both thighs and femurs, visible on both calves and fibulae, visible on both feet.</p>
	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: Intrauterine pregnancy, singleton live birth, placenta grade 0.</p> <p style="text-align: center;">✖</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the posterior wall of the uterus and is of grade 0.</p> <p style="text-align: center;">✓</p>	<p>Fetal umbilical cord: 2 umbilical arteries. Placenta: The placenta attaches to the anterior wall of the uterus and is of grade 0.</p>
	<p>Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 28 weeks and 4 days. The fetal cardiac ultrasound shows no congenital anomalies. Get urgent viva voce (bilaterally normal) and brain scan.</p> <p style="text-align: center;">✖</p>	<p>Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 26 weeks and 3 days. The fetal cardiac ultrasound shows no congenital anomalies. Get urgent viva voce (bilaterally normal) and brain scan. Suggest visiting a prenatal diagnosis clinic and undergoing MRI examination.</p> <p style="text-align: center;">✓</p>	<p>Examination prompt: Intrauterine pregnancy, single live birth, head position, placenta grade 0. The size of the fetus is equivalent to 26 weeks and 3 days. The fetal cardiac ultrasound shows no congenital anomalies. Get urgent viva voce (bilaterally normal) and brain scan. Suggest visiting a prenatal diagnosis clinic and undergoing MRI examination.</p>

Figure A6: Example of head abnormality of report generation.

B Detailed Description of Our Dataset

To fulfill the stipulated criteria for the automated generation of fetal multi-organ ultrasound reports, we collect a comprehensive dataset called ***FetusR***. FetusR comprises a total of 11,679 confirmed prenatal cases, totaling 130,394 images, obtained from our partner hospital between January 2014 and March 2024. The cases are obtained from the hospital’s prenatal ultrasound clinic and encompass a broad spectrum of fetal structural abnormalities. Each case includes complete original ultrasound image data and corresponding standardized ultrasound reports. FetusR comprises six categories of fetal abnormalities (Figure A1), namely abdominal abnormalities (AA), cardiac abnormalities (CA), head abnormalities (HA), limb abnormalities (LA), placental abnormalities (PA), and facial abnormalities (FA), along with normal (NM) cases. The respective case numbers for each category are as follows: 277 (AA), 3,668 (CA), 641 (HA), 698 (LA), 2,620 (PA), 987 (FA), and 4,000 (NM).

Ultrasound images were obtained using equipment from Samsung and Sonoscape manufacturers, encompassing the multi-standard sections mandated for standard prenatal screening. All ultrasound reports were prepared by the ISUOG prenatal ultrasound examination standard template to ensure consistency and standardization of report content (Khalil et al. 2024; Salomon et al. 2022). The diagnostic evaluation, image acquisition, and report writing for each case were conducted by the same ultrasound physician with over a decade of prenatal ultrasound experience, ensuring data consistency and professional standards. To ensure the accuracy and reliability of the data, all cases must be confirmed through a meticulous postpartum follow-up review. Furthermore, all case information undergoes rigorous de-identification during collection and organization, ensuring the complete removal of any personal identifying information to safeguard patient privacy. This study has been reviewed and endorsed by the Ethics Committee of our institution, and all subjects have provided written consent for their participation.

C Entire Report of Confidence Example

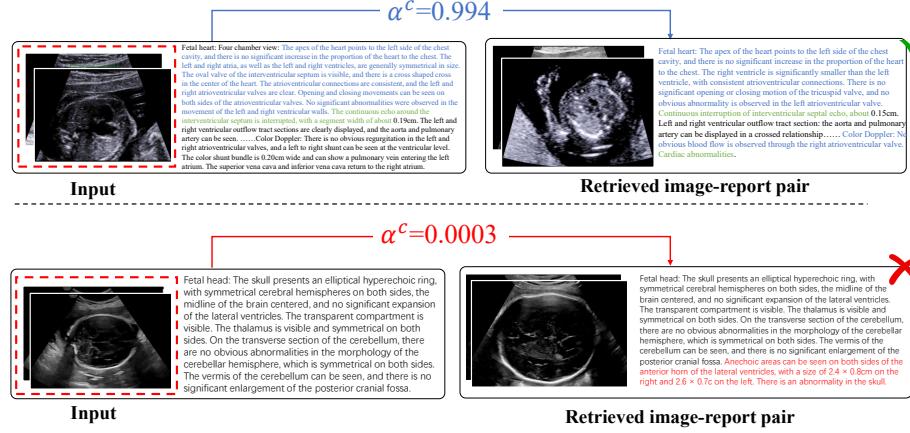


Figure A7: Example of retrieval results

D Hyperparametric Experiments

For the multimodal retriever, we use ViT-Base as the backbone which was pre-trained on ImageNet-21K. During training the ViT-Base, we fine-tune only the last two Transformer blocks, freezing all remaining layers. We use the Adam optimizer with a learning rate of 1×10^{-5} , a batch size of 8, and train for 30 epochs. The training loss is a weighted combination of $\mathcal{L}_{\text{organ-con}}$ and $\mathcal{L}_{\text{ab-sup}}$, where the loss weight λ is set to 0.33. We index images in FAISS using 768-dimensional features obtained by mean-pooling patch tokens from the last ViT layer. Dynamic Routing is then applied to retain only confident, informative samples from the retrieved set. Specifically, decaying weights w_i are first computed with $\beta = 0.2$, followed by a smoothed and weighted match probability p_{match} computed under $\gamma = 1 \times 10^{-5}$. Finally, the confidence score α^c is calculated using a sigmoid function with scaling factor $\sigma = 10.0$ and bias term $\delta = 1.0$. For the multimodal foundation model, we use InternVL as the backbone. We apply AdamW optimizer with an initial learning rate of 4×10^{-5} , a weight decay of 0.01, a batch size of 4, and train for 7 epochs. We also set the random seeds explicitly to the corresponding dataset indices used in the train/validation/test splits, ensuring reproducibility. Exact details are provided in the code. For all datasets, we resize all images to 384×384 square resolution, and then split them into training, validation, and test sets with a ratio of 0.65:0.10:0.25, respectively. All experiments were implemented using PyTorch and conducted on 4 NVIDIA A100 GPUs.

We consider both the trend and the top-retrieved accuracy to be equally

important; therefore, δ is set to 1.0. Additionally, accounting for scenarios where all retrieved labels are identical (requiring high confidence) and cases with maximum label entropy (requiring low confidence), as well as the need to separate confidence scores across differently distributed samples, we require the sigmoid function to be relatively steep. Hence, we select $\sigma = 10.0$. Under these conditions, Figure A8 illustrates the relationship between lambda rate, confidence threshold, and top-1 retrieval accuracy. Consequently, we choose $\beta = 0.2$ and *confidence threshold* = 0.04.

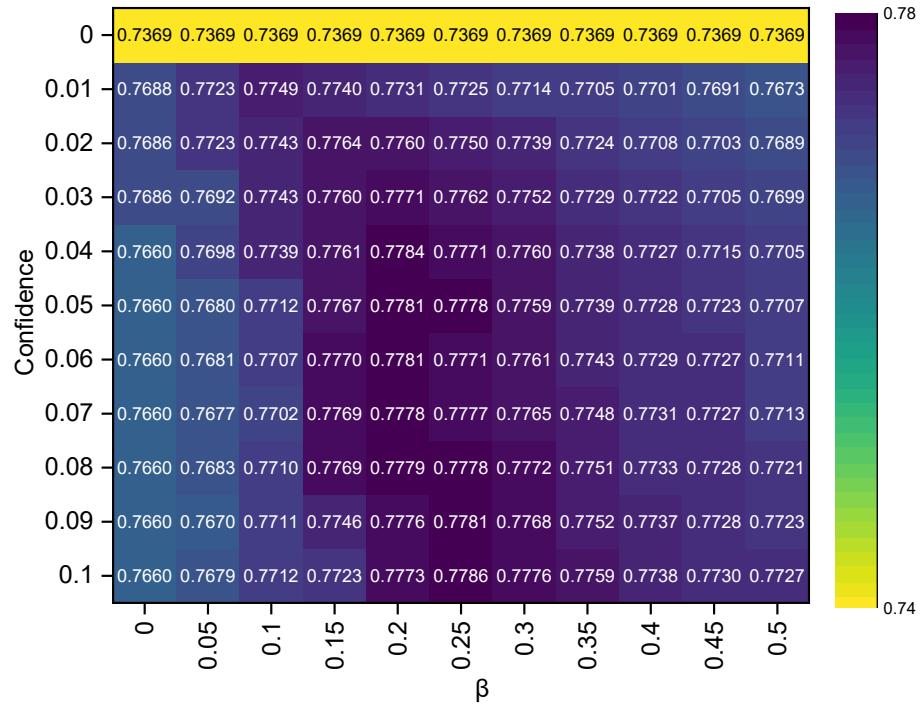


Figure A8: **Top-1 retrieval accuracy with different β and confidence.**